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SOUTH PACIFIC COMMISSION

quarterly BULLETIN

VOL. 5. NO. 1 JANUARY, 1955

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PUBLISHED BY THE SOUTH PACIFIC COMMISSION, NOUMEA, NEW CALEDONIA

THE SOUTH PACIFIC COMMISSION

The South Pacific Commission is an advisory and consultative body set up by the six Governments responsible for the administration of Island Territories in the South Pacific region. Its purpose is to recommend to the member Governments means for promoting the well-being of the people of these territories. It is concerned with social, economic and health matters. Its headquarters are at Noumea, New Caledonia.

The Commission was established by an Agreement between the Governments of Australia, France, the Netherlands, New Zealand, the United Kingdom and the United States of America, signed at Canberra on the 6th February, 1947, and finally ratified on the 29th July, 1948. Until the 7th November, 1951, the area of the Commission's activities comprised territories lying generally south of the equator from and including Netherlands New Guinea in the west to the French Establishments in Oceania and Pitcairn in the east. On 7th November, 1951, an additional Agreement was signed at Commission headquarters in Noumea on behalf of the six participating Governments, extending the scope of the Commission to include Guam and the Trust Territory of the Pacific Islands under United States administration.

The Commission consists of twelve Commissioners, two from each Government, and from 1948 until 1953 met twice a year. It now normally holds one Session each year. There are two auxiliary bodies, the Research Council and the South Pacific Conference.

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The Research Council, which assembles once a year, held its first meeting in May, 1949. Members are appointed by the Commission, and are selected for their special knowledge of the questions with which the Commission is concerned, and the problems of the territories in these fields. The chief function of the Research Council is to advise the Commission what investigations are necessary. Arrangements to carry out those that are approved are the responsibility of the Secretary-General and other principal officers.

The South Pacific Conference, which meets at intervals not exceeding three years, consists of delegates from the local inhabitants of the territories, who may be accompanied by advisers. The first Conference was held in Suva in April, 1950, and was attended by delegates from fifteen territories and from the Kingdom of Tonga. The second Conference was held at Commission headquarters in April, 1953.

The Commission's staff includes six principal officers, as follows: Secretary-General, Dr. R. C. Bedell; Deputy Chairman of the Research Council, Dr. E. M. Ojala; Deputy Secretary-General, Mr. John Ryan; Executive Officer for Health, Dr. E. Massal; Executive Officer for Economic Development, Dr. A. H. J. Kroon; Executive Officer for Social Development, Mr. H. E. Maude, O.B.E. The Deputy Chairman and the three Executive Officers are ex officio members of the Research Council. The principal officers are supported by a small technical and administrative staff.

Further particulars of the Commission's activities may be obtained from the Secretary-General, Noumea, New Caledonia.

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THE SPC QUARTERLY BULLETIN, first published in January, 1951, features articles on selected activities in the Commission's three main fields of operation: economic development, health and social development. Articles are also contributed by specialists working in these and related fields, in the territories within the Commission area.

THE BULLETIN is given selective world distribution to people and institutions in widely differing fields sharing a common interest in the purposes and work of the Commission. It is published in two editions, English and French.

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Left: A Samoan village. Houses are built around an open space with a cricket pitch at the centre. Right: Clean and neat surroundings in a Fijian village.

Village Hygiene

A high standard of village hygiene is an essential requirement in any programme designed to promote good health in Pacific island communities.

By EMILE MASSAL*

IT is universally accepted to-day that hygiene occupies a place of primary importance in the development programme of any nation or territory. Economic production, social activity, intellectual and artistic expression cannot attain the maximum of force and brilliance unless the peoples are protected by suitable measures against the many dangers which are always present in the environment.

The aim of hygiene is to eliminate or reduce external factors whose influence on man's physical, social and mental well-being is a harmful one. The outer environment, however, also contains elements favourable to human activity; hygiene should, therefore, include the preservation and development of these natural resources which are likely to contribute to improving the living standard of communities.

This broad definition of hygiene, and the wider understanding of the relations existing between the environment and man, seem particularly acceptable in the rural sphere. In villages, hamlets, isolated dwellings, man is in intimate and permanent contact with both good and bad external forces. Less well equipped with means of protection and defence than town dwellers, the rural population benefits very largely from the natural processes which, if not always apparent, are nonetheless effective. However, it would be too optimistic to rely entirely on the good offices of nature, particularly since man's behaviour, through his lack of understanding and incomplete knowledge of natural phenomena, is often clumsy; the favourable elements are destroyed or pass unnoticed, and at other times are inadequately used.

Hygiene, an important part of the development of rural populations, is the essential element of health work in the villages. The changes which it brings about in the outside environment are not always immediately felt; the effects of long-term work will not appear for some time, since careful planning and daily efforts are required. Sometimes, on the other hand, application of simple but sound measures results in improvements which far exceed expectations. Generally speaking, the importance of a problem diminishes as the development of the area affected proceeds, and increases with the multiplication of adverse factors, physical and biological; in rural tropical areas such factors are often at their maximum.

The great majority of South Pacific peoples are rural dwellers. In their islands, environment, social structure, and economic standards vary considerably. Living conditions are best where elements were and are still most favourable; they remain extremely primitive wherever small, superstitious, uneducated and poor peoples have been unable to reduce or domesticate particularly powerful natural external forces.

Many of these peoples, however, are aware of their needs, realise the problems raised by rural hygiene, and have often discussed the planning and working out of solutions. Village hygiene was one of the subjects on the agenda of the First South Pacific Conference which brought together in Suva, Fiji, in 1950, the representatives of the native populations in the various territories. Although imperfectly aware of the basis and the means of action, the delegates proved the obvious wish of the peoples to see rural hygiene developed and expressed on several occasions and in a pertinent fashion, extremely interesting viewpoints, notably the willingness of islanders to co-operate. This is essential, since only the participation of the people can ensure the stabilization and continuance of the improvements resulting from the measures taken.

* * * *

The problems which form the subject matter of rural hygiene are numerous; they are concerned with disposal of used matter and water and household refuse; water supply; houses; bodily cleanliness; food; insects, rodents and other animals which carry human diseases, and animal diseases which can be passed on to man. In short, they are the same problems with which hygiene in general is concerned; but the rural sphere modifies their importance and often makes it necessary to apply special solutions.

Disposal of Waste

Disposing of used matter and water, in order to render them harmless, sets

* Dr. Emile Massal is Executive Officer for Health to the South Pacific Commission.—Editor.

a difficult problem. The dangers incurred by these waste products of human and animal life are considerable; the hot damp atmosphere of the tropics multiplies them. In rural areas, the bush, stream or river, and beach, act as a general drain. Microbic germs and parasites pollute the soil and water, develop there and set up formidable endemics which can give rise to fatal epidemics.

The solution can be either collective or individual. Building a network of drains and complex installations for treatment of this waste matter is out of the question. I have no faith in simple collective facilities; the responsibility for maintenance falls to everyone, that is to say, in free communities to no one in particular. Even in many advanced communities these communal installations have proved most disappointing in spite of heavy maintenance costs. The solution varies with the individual case. It should be adapted to habits, customs, and local conditions; an inaccurate knowledge of these can lead to mistake or incomplete solutions.

The traveller who lands at Upolu Island airport in Western Samoa and continues his journey towards the town of Apia, is struck by the beauty of the landscape but surprised to see, all along the beaches, rows of small cabins built up on piles and connected to the mainland by delicate foot bridges. The purpose of these kiosks does not escape him long, particularly if he goes down on to the beach in order to retain from his stay a photographic memory of a glorious sunset. A doctor friend will explain that it was decided in the past to build these cabins to guard against hookworm, dangerous parasites in the human intestine; the eggs, which are passed out in the stools, hatch into larvae on the damp, warm earth and these attack men by penetrating actively through the skin, particularly of the feet. By abandoning the bush and using these cabins, man breaks the life cycle of the parasite, the larvae being destroyed by the mechanical and chemical action of the ocean. This practice has been associated with a decrease in hookworm infestation. However, the more shrewd traveller will notice that many of the cabins are badly looked after and are far from the houses, and he will wonder to what extent they are used, especially at night.

The Papeete market, in Tahiti, is supplied with fine-looking vegetables by the Chinese market gardeners. Their methods of cultivation are well-known; legislation has been passed forbidding the use of human excreta as manure. This is a wise measure in past and present conditions of utilization. However, it is recognized that human excreta should continue to be used as manure provided the dangerous germs and parasites which might be contained in it are destroyed. Composting with other waste matter in an enclosed container can easily be carried out even for small quantities; the adherence to certain fundamental principles, which are easily understood and applied, is sufficient practically to eliminate pathogenic germs and helminth eggs.

These composting processes do not seem to be usable everywhere in the South Pacific, and for the native villager it seems difficult at the present time to recommend anything other than the simple family pit, deep and narrow, with a covering lid and eventually a water seal system serving as protection from smells and flies.

Household refuse and other waste are most often scattered around the houses and kitchen; poultry and pigs which are allowed to roam about freely subsist on it; flies swarm around it and the rats come and eat it during their nightly expeditions. In a few of the better-kept villages, this waste matter is collected in pits some distance from the houses, and is burnt periodically.

In American Samoa several villages were seen where household refuse was collected in open oil drums; it was collected together periodically in a motor truck and tipped into the sea from the top of a cliff.

In certain atolls in the Tuamotus primitive attempts at composting were witnessed. The inhabitants tipped their household refuse and other waste into former taro pits, mixing it with earth sometimes brought from high islands. They thus built up gradually a small plot of fertile soil in which to grow a few vegetables and fruit trees. This practice should be encouraged and developed everywhere; and more especially in coral islands where the extent of soil suitable for subsistence crops is very limited.

Water Supplies

The way in which rural peoples are scattered makes it very expensive to establish an adequate supply of drinking water. All surface water in the tropics, and any unprotected well, particularly in the neighbourhood of dwellings, should be considered as polluted.

The problems involved are complex and vary with the environment; they require the attention of both the engineer and the hygiene specialist and, since they are generally very costly, are closely dependent on financial possibilities.

In the small volcanic islands with a fairly dense population localized in the coastal belt the problems are relatively less complex. In Tahiti and the other high islands of French Oceania, the administration has for many years maintained a policy of clean and plentiful water for all.

In prospecting the high valleys a number of springs were discovered. When the quality of the water had been approved by chemical and biological analysis, the source head was developed, protective boundaries set up, settling basins and reservoirs constructed, and pipes for distribution with public and private taps were installed. The local administration supplied the necessary equipment, and the peoples provided all necessary labour free. Supervision and periodical cleaning of the installations is carried out under the direction of the chairmen of the local Councils.

At the present time all villages in Tahiti possess excellent water systems; almost the entire rural population has an abundant supply of good water (checked periodically by biological examination). The other islands have not been forgotten; the effort is being sustained and it can be expected that in the very near future all the populations on high islands will be supplied.

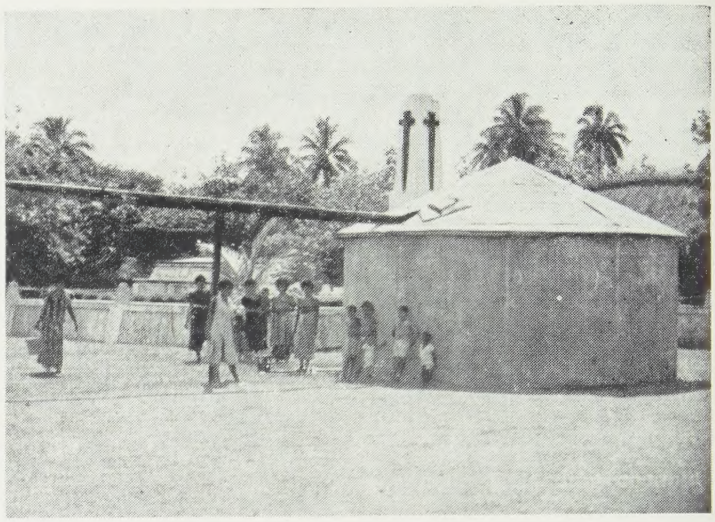
In coral atolls the solution consists of collecting rain water on the corrugated iron roofs of communal dwellings, churches, temples, houses, and keeping it in tanks. As a result of the combined efforts of the administration, which provides the equipment, and of the population, which supplies labour and maintenance, most of the islands now possess tanks of sufficient capacity except in periods of prolonged drought; at such times rationing becomes necessary. However, it is regrettable that too many of these tanks are not covered; the water is thus polluted by foreign matter of various types and harbours mosquito larvae.

The possibility of using solar stills in the atolls has been considered; results do not seem very encouraging, the output being low. Finally, adaptation to local conditions of the numerous processes for making sea water fit for human consumption might be looked into.

It must be added that other territorial administrations are also carrying out programmes for improving the supply of clean water to the villages.

Housing

The home of the South Pacific islander is, as everywhere else indeed, particularly suited to local conditions, materials available, climate, social habits, etc. This does not mean that the dwellings always fulfil the rules of hygiene; far from it. Ventilation and lighting are too often inadequate, the floors of rammed earth are often polluted and damp, and in places there is excessive overcrowding. There is much room for improvement. Advice and attempt have not been lacking, but they have not always been very successful, since emphasis has often been placed on introducing foreign types of dwellings rather than in making a serious attempt to improve the native hut.



Left: A neat and well-kept latrine built over the water. It belongs to a Western Samoan medical practitioner. Right: A water tank fed from corrugated iron roofs. Fiji, near Lautoka.

In the Austral Islands Group, at Mangareva, and in the Cook Islands, I have come across huge constructions with thick stone walls, pierced with narrow windows, the floor paved with stones and the roof made of plaited coconut or pandanus leaves, which resemble a fortress rather than a tropical dwelling. It should be added that the islanders leave them willingly to go back to their ancestral huts.

Furthermore, in New Caledonia for instance, the natives have been encouraged to build rectangular daub dwellings, with European doors and windows (a wooden panel often replaces the panes), with a narrow verandah on the long sides, a floor of rammed earth and a roof of plaited leaves, niaouli bark or corrugated iron. Elsewhere one finds wooden houses, a simple cubic construction sometimes made more attractive by the addition of a verandah, with a corrugated iron roof.

None of these new types represents real progress. The islander was in the habit of renovating his hut periodically as soon as the shelter afforded was considered inadequate. On the other hand, once he has built a European type house, he considers it should last indefinitely without any maintenance. The result is too well known for us to dwell on it longer.

Moreover, the native hut is capable of improvement; sufficient proof of this is given by the fine achievements of a number of Europeans who have adopted the Tahitian hut, fitted it with every comfort one could wish for, and consider it far more comfortable than any other type of habitation. Without going so far as to recommend that islanders should imitate these often very expensive adaptations, I consider that in many villages the solution lies in improving the native hut, kitchen and bathroom.

A survey of the question is essential; it should deal with drawing up plans for types of houses which might be easily enlarged, the better utilization and preservation of local materials, the adaptation of simple sanitation installations and rational equipment of kitchens, and the average duration of these dwellings, a minimum of maintenance being taken into account.

Certain villages in Samoa, Fiji, and the Trobriands for instance, with their dwellings arranged neatly around a central clearing, give a pleasantly harmonious impression. Elsewhere, the way in which houses are scattered haphazardly makes the villages less attractive. Sometimes also the site is unsuitable, or the surrounding district unhealthy. A number of reasons which do not escape my notice make necessary or justify measures which, at first sight, seem to be determined by chance.

Improvements are often possible. I call to mind the former village of Tatakoto in the Tuamotus, built on damp ground at the edge of the inland lagoon in a hot and airless spot. The villagers complained that they were pestered by large numbers of mosquitoes and blamed the poor situation of the village for encouraging tuberculosis which took its toll mainly of the infant population (serious primary infections of lymphatic type).

With the help of a Catholic missionary they decided to move their village. A new site was chosen, facing the open sea, well ventilated and on the dry soil of the atoll. Roads were marked out at right angles in the coconut groves allowing space around each dwelling. Dwellings were built on a raised platform, from coral and lime blocks, with fairly thin walls and large openings; the roofs were in corrugated iron so as to collect rain water in individual tanks. The whole effect is neat, attractive and clean; occasional painting over with whitewash and painting the iron roofs ensures maintenance.

This achievement, carried out by a system of mutual aid and partially financed by the local co-operative society, was repeated in other islands of the group. It shows how the wishes of the population can be met with a minimum of guidance and means.

Disease Prevention

Mosquitoes, flies, fleas, ticks and mites which carry or spread human diseases are common in South Pacific villages. Malaria, filariasis, plague, scrub typhus, dengue, intestinal germ infections, etc., were, or are, rampant either in the endemic state or else in the form of epidemics of varying severity. It is not proposed to enter into the epidemiological details of these diseases here; let it suffice to say that often, through the clumsiness of his activity, through his waste, man encourages the increase of the parasites or makes more frequent contact with them possible.

Rational control of these diseases must essentially be based on the control of the insect and other carriers, although in special conditions other measures (vaccination for instance) can be of much use. In the villages of Fiji, for some years past, an attempt has been made to eradicate the local filariasis carrier, *Aedes scutellaris pseudoscutellaris*. Under the direction and control of filariasis inspectors, the villagers have undertaken and continue destruction of larval breeding places and of resting places of the adult mosquitoes in the villages and within an area of approximately 100 yards radius around the dwellings. Land clearance, collecting used coconuts, food tins, pieces of broken bottle, etc., sealing up tree hollows, are carried out periodically and

with the greatest care. Application of these measures was started in 1947; it was preceded by a wide epidemiological survey. It is regretted that the exact figures cannot be given, but I was informed that results are encouraging. Identical measures were put into operation in the Cook Islands around 1950.

The use of residual insecticides in fly control has given only partial results, since these insects rapidly acquire a marked resistance to the products used. Suitable measures for dealing with household refuse and used matter will ensure more effective and less costly control of these insects. In this respect, it would be interesting to discover the reason for the fact that in certain islands flies are scarce whilst in others they are found in great numbers. What are the reasons for these differences? The existence of a larva parasite in the soil seems an *a priori* possibility.

Spraying houses with residual insecticides against certain domestic mosquitoes seems fully justified. However, it exceeds the present possibilities of the villagers.

Cleanliness

Bodily hygiene and food hygiene will be considered briefly. Individual hygiene is closely linked with the question of water supply, the use of soap, and health education; it will improve along with the progress achieved in these fields.

Food hygiene presents a more difficult problem. On the individual and family level, clean habits in handling foodstuffs depend on the equipment of kitchens, the utensils available, and preserving methods, although most foodstuffs are eaten fresh from day to day. On the community level, the hygiene in village markets and food stores is chiefly a matter of legislation.

Means for Improving

The means of putting into practice the acquired knowledge in order to improve village hygiene, in rural areas, must now be considered. The notion of the interrelation between the various problems set by hygiene should always be kept in mind. The repercussions which one question has upon the rest and the close links which bind them make it essential to carry out a preliminary general survey of all the factors involved. The economic and social aspects must be determined as apart from the technical problems; thus it is often possible to discover an economic and satisfactory solution to several problems at once.

In the course of a survey, the extent to which the local population can be expected to participate will have been studied, as the support and contribution of those concerned are essential to promoting any hygiene measure. On the lowest level, contribution can at least consist of unskilled labour and local materials. The contribution of the islanders should be sought and developed by all possible means. Then participation of the administration and the way it can be shared amongst the various levels can be assessed.

Finance The Most Serious Problem

The most serious problem remains that of finance. Each administrative authority should accept a burden in proportion to the importance it attaches to problems of rural hygiene and the advantages it can expect to draw from it. The necessary funds might be obtained from loans made at low rates of interest; grants-in-aid; or special budgetary resources, according to the amounts available, habits, and experience acquired in financing works of general interest. All organizations of semi-public nature, co-operative societies, and various associations can be approached, and private enterprise encouraged. The example of a neighbour's achievement is a considerable source of encouragement where hygiene is concerned.

It is equally difficult to procure the necessary materials. Their high costs and the difficulties of obtaining them when needed make it necessary to use local resources to the full. The development of local, private, co-operative or public industries must be considered and promoted.

No country or territory can bring a programme of rural hygiene to a successful conclusion without qualified personnel. The more undeveloped the area, the more necessary it is that this personnel should include, on the one hand, highly qualified specialists (sanitary engineers), and on the other, local technicians trained rapidly in the field for carrying out specific activities.

The presence of a specialist is highly desirable at each administrative level. He should be trained locally in a way suited to the conditions of the area in which he will have to work so that he will be able to recognize the importance of various problems and determine the one requiring the most urgent solution in a given area. The training of local personnel should be adjusted to needs, and be well-balanced, forceful and attractive; thus, the potentialities for action will increase.

In working out plans and programmes for rural hygiene and in putting them into operation account should be taken of the general administrative organization and of the organization of health departments; it is around these already-established centres that activities can be started or developed.

Education of Primary Importance

In conclusion, I should like to stress the capital importance in rural hygiene, of education of the peoples and of their instructors; of co-operative and community developments; and of suitable legislation.

The participation of the islanders is, I repeat, essential. To this end it is necessary that the people, while giving voice to their desires, understand the why and how of things. The villagers' activities will be all the more fruitful for it. Co-operative societies in particular represent the most powerful means of "internal" assistance, or self help, which is considered as the aim to be achieved by all possible methods in the promotion of rural hygiene.

International Plant Protection Convention

With the recent announcement from Canberra that the Australian Government had extended the International Plant Convention to the territories of Papua and New Guinea, Norfolk Island and Nauru, the position of the Commission's member Governments and their South Pacific territories in relation to this Convention now stands:—

AUSTRALIA—signed and ratified with extension to Papua and New Guinea, Norfolk Island and Nauru.

FRANCE—signed but not yet ratified.

NETHERLANDS—signed and ratified with extension to Netherlands New Guinea.

NEW ZEALAND—signed and ratified with extension to Western Samoa and Cook Islands.

UNITED KINGDOM—signed and ratified but not yet extended to overseas territories.

Under the Convention, the contracting governments undertake to adopt measures for effectively preventing the introduction and spread of pests and diseases of plants and plant products, and to promote control measures. The Convention has particular reference to pests and diseases of importance to international trade.

Each contracting government undertakes to provide to the best of its ability for an official plant protection organization; the distribution of information within the country on plant pests and diseases and their control; and research and investigation in plant protection. The Convention provides for participation in any special campaigns for combatting particularly destructive pests or diseases which may seriously threaten crop production and need international action to meet the emergency.

Contracting governments also cooperate with the Food and Agriculture Organization of the United Nations in the functioning of a World Reporting Service on the occurrence and means of control of plant diseases and pests.

RHINOCEROS BEETLE ERADICATION

Supervision Important In Trapping Campaigns

While there is no doubt that the system of log trapping used to catch adults of *Oryctes* will reduce populations considerably, lack of close supervision may produce the opposite effect.

According to Dr. R. A. Cumber, the Commission's entomologist working on rhinoceros beetle ecology and control aspects in Western Samoa, an isolated trap which in all probability had not been inspected since it was originally laid some eight months previously, was discovered in September, 1954, on one of the estates in Western Samoa. Situated centrally on a badly-damaged plantation, it was partly overgrown with sensitive grass. The trap comprised nine pieces of split log, each approximately four feet in length and seven inches in diameter, the logs being placed side by side face downwards. The nine logs harboured 85 third instar, and 5 second instar larvae, the only solid portion of the logs remaining being the outside shells.

This find indicates the necessity for close supervision and gives weight to the contention of some people that the advantages of trapping are outweighed by the breeding in neglected traps. The disposal of the logs once they become old and unsuitable for traps has also to be carried out.

Traps should be set up along regular lines, readiness of access by vehicles being the prime consideration in the exact siting. Traps should be installed only where the labour for attending and disposing of old traps is guaranteed.

It is characteristic of the habits of the insect to find occasional scattered larvae in odd stumps, log ends, etc., but also here and there where conditions are suitable, very large numbers of larvae within a limited amount of medium. Careful and systematic searching of all possible breeding sources in an area is essential.

Even where the labour force and equipment is not available for the disposal of palm wood, there would appear to be distinct advantages in the gathering together of such material into disposal centres which may be searched regularly.

A Useful Green Vegetable

Among recent introductions at the Naduruloulou Plant Introduction and Quarantine Station, Fiji, was a small quantity of seed of the Indian or climbing spinach (*Basella alba*), known also as "Poi" (F.D.A.13836). The plants raised from this seed proved to be quite different from those usually grown in the Colony. The stems and leaves are much larger and heavier; indeed, the whole plant is abnormally large and prolific. Seeds from the locally-grown plants grow true to these characteristics and provide a very large crop of succulent greens for domestic use. Seed is available in limited quantities from the Department of Agriculture, Suva, Fiji. —(B.E.V.P. in the *Fiji Agricultural Journal*, December, 1953.)

New Secretary-General For South Pacific Commission

Dr. Ralph Clairon Bedell, B.Sc., M.A., Ph.D., has accepted the appointment of Secretary-General of the South Pacific Commission which became vacant in December last on the retirement of Sir Brian Freeston, K.C.M.G., O.B.E.

Dr. Bedell is at present serving in Washington as Director of the Program Development and Review Branch in the Division of International Education, United States Office of Education, Department of Health, Education and Welfare. In this capacity he is responsible for recommending technical assistance programmes in education for 33 countries and dependent areas where such programmes have been established.

Dr. Ralph Clairon Bedell

Dr. Bedell, who is 51, has had many years of administrative and financial experience in American universities, particularly in the fields of education, vocational training and sociology. He has taken an active part in the work of the Caribbean Commission and the West Indian Conference and has travelled widely in Canada, Mexico, Central and South America and the West Indies.

It is anticipated that Dr. Bedell will take up his new duties early in March.

Subsistence Agriculture Surveys

During October and November, M. J. Barrau, the Commission's Subsistence Agriculture Officer, visited the British Solomons and Papua to continue his surveys of native subsistence agriculture in Melanesia. In the Solomons, M. Barrau studied the food crops of various villages on Malaita, Guadalcanal and Wana Wana. In Papua, the Goilala area in the highlands, and villages in the Purari Delta were covered.

These studies are an extension of the research undertaken in 1953-1954 in New Caledonia, New Hebrides and Netherlands and Australian New Guinea. The main objectives of M. Barrau's work are to assess the subsistence food resources of the Melanesians and to survey the agricultural methods used for food production with a view to suggesting possible improvements. A similar treatment of Polynesian and Micronesian territories is to follow.

I.F.O. Acquires Research Vessel

The *Orsom III*, built in Australia in 1947 as a purse seiner, was purchased in November by the French Institute of Oceania, Noumea, and will be converted to an oceanographic research vessel. This fine ship is 75 feet overall length, with a beam of about 18 feet, nett tonnage being 67.54 tons. She is powered by a 135 h.p. Catepillar V8 Diesel engine.

It is intended to fit her for a wide range of research into biological and physical aspects of oceanography, including experimental fishing operations. She will carry a field laboratory, and, among other equipment, echo-sounders, an oceanographic winch, a fishing winch and long line gear.

The grants-in-aid made by the South Pacific Commission in 1953 and 1954 towards the cost of the oceanographic research programme of the French Institute of Oceania have been earmarked by that organisation for the purchase of special equipment for *Orsom III*, and extensive orders have already been placed in France and the United States. —L.D.

Taro Disease in British Solomons

The phytophtora disease of taro is now causing damage in the Western British Solomons. On Wana-Wana Island, for instance, taro, which was the staple food crop, has practically disappeared in the course of the last two years. (A note on the decline of this disease in the Australian Solomons, where it reached epidemic proportions in 1947 - 1948 and where some resistant strains found in native plantings were selected for multiplication, appeared in the April *Quarterly Bulletin.*)—J.B.

Coffee plant in full bearing, Santo, New Hebrides.

Processing Coffee Beans

By E. J. E. LEFORT*

A world-wide revival of the coffee industry is developing. This new expansion might well have unfortunate repercussions in countries which are insufficiently prepared for the stresses occasioned by economic competition. Indeed, good quality is now much sought after, and the various markets are becoming daily more inaccessible to low grades of coffee beans. Every grower is aware of the importance, in coffee processing, of adopting a sound method which will produce parcels of reliable quality and grade. Desirable standards are not always reached, because of inadequate coffee-processing techniques. Yet the strict application of sound processing techniques always enhances the value of the produce without increasing production costs. Coffee processing methods are briefly reviewed below, with a short description of the equipment required.

COFFEE processing is the operation by which the bean is set free from its different coverings (silvery skin, parchment, mucilaginous pulp and integument) in order to obtain marketable coffee. The way in which this operation is carried out determines the commercial value of coffee just as much as the respective qualities of each variety of coffee shrub. The importance of devoting the utmost care to an operation which is always delicate, cannot therefore be overstressed.

Two Main Methods

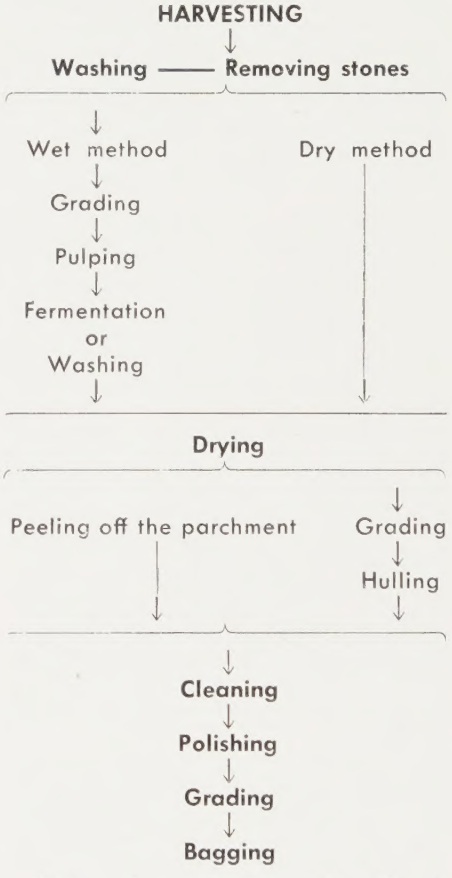
Two methods of preparation are commonly used in the coffee-growing countries: the dry method, by which the whole berries are naturally or artificially dried without previous treatment; and the wet method, by which the berries are dried after pulping and fermentation. Each method has its adherents, but the choice depends on such factors as climate; availability of water, firewood and labour; size of plantation and configuration of the area.

Dry Method: The dry method, which requires only very little equipment, is by far the simpler. It is ideally suitable in sub-tropical areas where the dry season coincides with harvesting time. It is also commonly used on the small European or native plantations and, on larger plantations, in the early or late stages of harvesting when the crop is not sufficient for the capacity of the processing plant. Further, it is the only possible method for processing green or withered berries which cannot be pulped, or for use in areas where the water supply is inadequate.

This method, although simple, makes heavy demands on both time and labour (for handling the coffee during the drying process) and requires extensive drying surfaces.

Wet Method: The wet method is therefore preferred on the bigger holdings with large-scale production requiring a high processing rate. This method, in which fermentation is used to remove the sticky covering of the bean, is difficult, and is liable to certain hazards which can result in an alteration of the colour or of the aromatic quality of the coffee beans. However, it has a further advantage over the dry method: it destroys the coffee bean borer and usually produces beans of a more uniform quality and lighter colour, for which preference is shown on the market.

As will be seen from the following diagram, the final operations in coffee processing are the same, whether the initial handling of the berries is done by the wet or the dry method.



Before the technology of coffee is considered, it might be useful to comment on the gathering of the berries, which affects the carrying out of the various operations and, consequently, the commercial value of the final product.

Gathering should be planned to give regular daily production in order to avoid intermittent deliveries to the mill, which disorganize operations and are invariably the cause of the main defects in the processed beans.

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Only the ripe, or nearly ripe, berries should be picked. Harvesting by friction results in the gathering of berries in all stages of ripeness and is likely to prevent uniform drying and fermentation; this method should not be used. All the fallen berries should be gathered from time to time during the course of harvesting, and the withered or spotted fruits should be picked. This will enable the grower not only to obtain a larger crop, although of poorer quality, but also to control to some extent the spread of *Stephanoderes coffeae*, the coffee bean borer.

Processing by the Wet Method

In the wet method of processing, the coffee undergoes pulping and fermentation first, and is then dried in the parchment. The resulting product is commonly referred to in commercial spheres as "washed coffee".

It has already been stated that this method requires considerable supplies of water. Moreover, the water must be fed into the upper part of the mill, as it must naturally carry the berries to be processed from one operating centre to the next, from washing to drying.

Washing the Berries: This is a very important operation, particularly in the case of a non-selective picking, including berries in all stages of ripeness, mixed with leaves, twigs, earth and stones. Such a mixture could not pass through the pulper; the purpose of washing is to sort out the various elements according to density.

Washing tanks may vary in type, but their purpose is always to eliminate foreign matter and to divide the batch into two lots, one of which, consisting of ripe berries, is heavier than water, while the second, lighter than water, comprises second-rate fruits. By means of sluices, deflectors and grates, a clean product is obtained, which is then sent either to the soaking tanks or pulpers, or to the drying grounds, according to whether the berries are of good or bad quality.

Grading: On some plantations the berries are graded before pulping, which allows a closer adjustment of the pulpers, lessening the chance of damaged or whole berries passing through.

Soaking: This practice is mainly used in Brazil. Its purpose is to soften those berries which are not ripe enough, in order to facilitate operation of the pulpers which extract the beans from their outer covering.

The soaking tanks, which are of very simple design, are fitted with a slanting base and a discharge sluice. Thus, according to variety and stage of ripeness, the berries may soak for any length of time from twenty-four to seventy-two hours before being sent to the pulping machine.

Soaking may be replaced by scalding, which facilitates the pulping operation and also has the advantage of killing borers in the beans.

Pulping: The object of pulping is to remove the pulp from the bean. There are disc- and cylinder-pulpers. The work is done by crushing and tearing. The berries are drawn in by the cylinders or the revolving discs and bruised against the bed, and are then torn by the rough surfaces of the moving parts of the pulper. The freed bean is then separated from the pulp by a blade.

A slime-removing cylinder-pulper has been devised; it gives a pulp-free bean by friction of the berries between a corrugated cylinder and a perforated cage, followed by pressure washing. The advantage of this machine is that it makes fermentation quite unnecessary. Unfortunately, this process requires a fairly considerable supply of power and water.

Adjusting the pulpers is tricky, and very often the mixture produced contains a certain amount of pulp and skin as well as small unpulped berries, besides the parchment grains. These various impurities are prejudicial to fermentation and drying, and must be removed if the planter wishes to prevent the beans from taking on a reddish tinge. This is done by fitting either oscillating shafts or two cylinders revolving in reverse directions at the outlet of the pulper.

The berries which have been drawn in with the pulp are recovered either by soaking (as the soaked fruits are heavier than pulp) or, directly, in the discharge grooves which are fitted with ribs so as to allow the pulp to run freely and hold back the berries. The produce thus recovered gives second-rate coffee.

Fermentation: Fermentation frees the beans from slime by disintegrating the sticky layers enveloping the parchment, thus ensuring adequate drying and, consequently, successful preservation.

Three fermentation methods are commonly used:

(1) The dry method of fermentation, in which the water used to transport the pulped berries into the fermentation tanks is removed;

(2) The wet method of fermentation, in which the berries are kept under water during the whole operation;

(3) The mixed method, which is a combination of both, the water being sometimes changed.

These methods may of course vary, but the aim is always to constitute a uniform bulk within a short time so that fermentation begins throughout at the same moment. Fermentation lasts about 24 to 36 hours; beyond this period the actual bean structure may be affected, giving the coffee inadequate colour or a particular odour.

It has already been pointed out that fermentation depends on the stage of ripeness reached by the berries. If they are not ripe enough tannins and acids will form; if over-ripe, they are deficient in sugar and the albumen in the bean deteriorates, thus resulting in the coffee being "white spotted".

Stirring up the mass of beans gives a start to the fermentation process. Changing the water once or twice during the process regulates the temperature and consequently the digestion of the sticky covering. Sound fermentation may be ensured and the process shortened by the addition of a small quantity of lime. Acidity of the bulk and the risk of deterioration of the beans increase with the length of time required for the disintegration of the pulp still attached to the parchment. Therefore, every device should be tried out in order to make fermentation as brief an operation as possible. To this end, the grower can warm up the water in which the berries are carried before and after the pulping; shelter the batches from the night dew; and remove the various waste matters which hinder fermentation, by renewing the water after 12 hours.

Controlled fermentation effected by means of pectic enzymes derived from mildew can now be used as a substitute for the more common spontaneous fermentation. This method accelerates the process and eliminates all risk of deterioration. With this method, disintegration of the sticky covering requires 5 to 10 hours according to the temperature.

Disintegration of the mucilaginous cells may be obtained within a few minutes by a chemical process, using a 2 per cent. solution of carbonate of soda in the water. Although this technological process seems to offer definite possibilities from both the economic and technical viewpoints, use of it has not yet become widespread.

Let us also draw attention once more to the fact that the slime-removing cylinder-pulper produces beans ready for drying directly without any microbial or chemical action.

The coffee beans are ready for drying when, after being thoroughly rinsed by hand, they are no longer slimy.

Washing the Coffee - in - Parchment: Washing may be carried out in the tank in which fermentation has taken place by shaking the beans under running water, or else in the open discharge drain by stirring, in the water used for carrying the beans.

Washing machines are simple and generally give good results. Some of them have a device for automatically removing the skins, unpulped berries and imperfect beans.

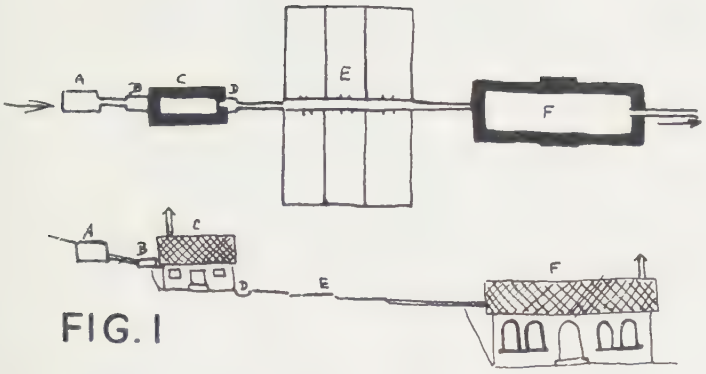

FIG. 1

Fig. 1: Schematic plan and elevation of a coffee processing plant. A—washing tanks, B—soaking tanks, C—pulping, D—fermentation tanks, E—driers, F—parchment removing, polishing and grading.

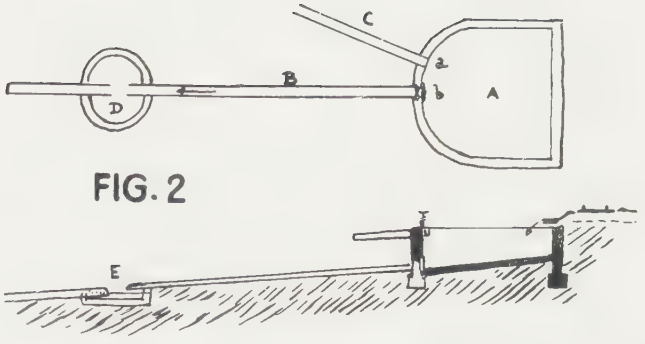

FIG. 2

Fig. 2: Washing tank, Brazilian type. A—tank, B—drain for washing down the beans to the pulpers, C—drain for washing down the berries and light debris to the driers, D—tank receiving heavy foreign matter (soil and stones), E—grate, "a" and "b", discharge sluices.

Some mills omit fermentation and restrict processing to thorough washing of the beans, intensified by the addition of small quantities of lime-wash or charcoal in the tanks.

After being washed the beans are put to drain for some time on perforated trays. Sometimes, in the larger mills, they are roughly dried in rotary dryers and sent to the drying grounds immediately afterwards.

From this stage onwards, the washed coffee undergoes the same operations as the coffee beans processed by the dry method, except, however, for the fact that in the latter case the berries are graded before being hulled.

The Dry Method of Preparation

The berries are washed and graded and stones are removed before the drying process.

Drying: Drying is effected by exposure to the heat of the sun or to artificially-produced heat; sometimes by a combination of both. It appears to be a less difficult operation than fermentation, but nevertheless requires continuous care.

The berries or the coffee-in-parchment are exposed to the sun on an area of rammed earth or on a cemented, paved or tarred area. However, in countries with a relatively damp climate, fixed or moveable shelters are sometimes preferred. In the latter case the shelter may be obtained by a system of drawers for the drying trays or by using revolving roofs over the drying grounds. There are, of course, a number of types of natural dryers which are, generally speaking, all satisfactory. Whatever the device adopted, the handling operations involved in drying are always numerous. Indeed, whether the berries are placed on drying grounds or on trays, the whole layer, not to exceed 2 to 3 inches in depth, must be stirred continuously.

Drying must be a gradual process, or in other words, the duration of exposure to the sun must be increased as drying progresses. At the beginning of processing, the grower should avoid over-exposure to sun, which causes the berries or the parchment to split, and results in faulty colouring of the coffee beans.

As for the handling on the drying grounds, it is better, at the beginning of the drying process, to leave the beans out in the rain rather than run the risk of heating through careless heaping. In the later stages, on the contrary, rain, as well as the night dew, are to be feared most, and not only is it then absolutely necessary to collect the beans into heaps, but also to protect them with awnings.

The drying process requires from 6 to 10 days for coffee-in-parchment and 12 to 20 days for the berries. It is possible to tell when the coffee is dry enough since, when shaken, the beans rattle, and the outer covering crumbles at the touch.

The high humidity and heavy rainfall occurring in some tropical countries force growers to carry out the drying process by artificial means which prevent the rain or damp from damaging the beans.

There are numerous types of hot-air dryers. They can, however, be divided into two types: static or discontinuous dryers, and mechanical or continuous dryers.

The static dryer is a closed shed inside which the coffee is spread on trays in layers 2 to 3 inches thick. A stream of hot air is sent through the coffee, absorbs humidity, and flows out through large apertures provided in the upper part of the building. In order to avoid a sudden and excessive rise of temperature, the heating apparatus must be placed at least 10 feet below the lowest trays. It is necessary to stir the coffee frequently, whilst ensuring at the same time that the layers retain uniform thickness.

In the mechanical type of dryer, hot air is blown into revolving cylinders or shakers in which the coffee is stirred by a mechanical process. This method has the great advantage of avoiding stirring by hand and the waste of time involved in loading and unloading.

Planters often combine both methods, using first sun drying and then hot-air drying. Preliminary drying in the sun eliminates about 20 per cent. of the water content, thus reducing the time and cost involved in the second operation.

The length of time required for hot-air drying varies according to the method and equipment used. Generally speaking, it may take from 24 to 48 hours, depending on whether the coffee to be treated has been pre-dried or merely allowed to drain. The temperature may be higher at the beginning of the process than at the end, and drop progressively from 90° to 55° C. However, most growers prefer to play safe and limit variation between 65° and 60° C., thus avoiding the risk of sudden heat which produces shrivelled beans with a burnt smell. Drying is complete when, under sufficient pressure, the bean divides into two parts along the hilum.

The moisture content of marketable coffee should not exceed 13 per cent.

Hulling (Breaking and Peeling Off the Parchment): Unless it is cooled by a stream of air, the coffee leaving the dryers should be heaped up and allowed to stand for at least one day before hulling. Sun-dried coffee, on the other hand, may be hulled immediately.

Breaking and removal of the parchment are done by friction, beating or pressure. One apparatus can generally answer both purposes; the only alteration necessary is adjustment of grip or rotation speed. Once the coffee in the hull or parchment has been freed from its coverings, the beans are winnowed.

After winnowing, the smaller berries and beans in parchment which have escaped unprocessed from the first hulling operation are sent back into the huller. With properly adjusted equip-

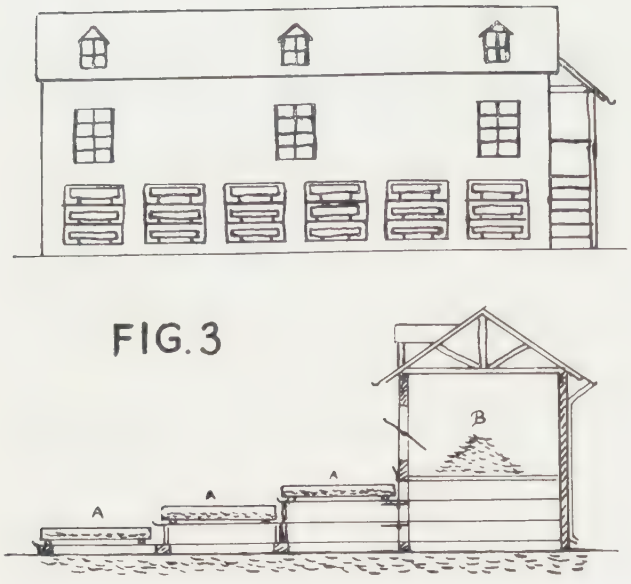

FIG. 3

Fig. 3: Coffee drier of the Guadeloupe type. A—drawers on rollers, B—drying and storage building.

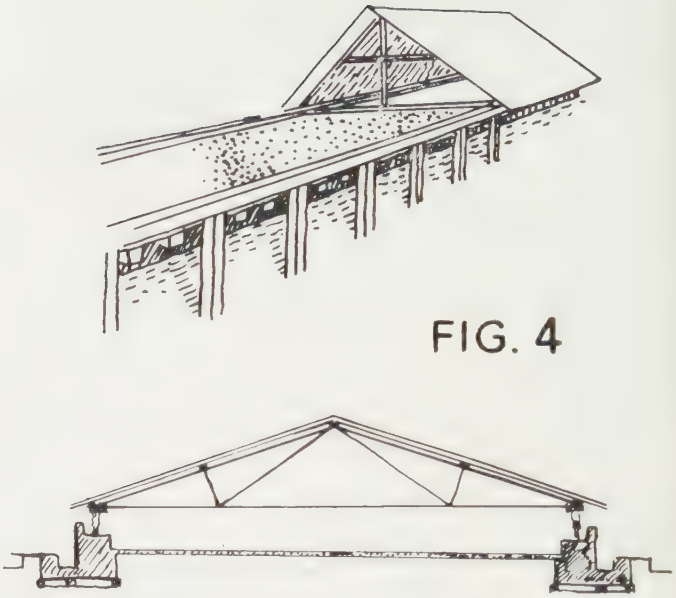

FIG. 4

Fig. 4: Jamaican coffee and cocoa drier.

ment, the percentage of broken beans varies between 1 and 5 per cent.

Polishing and Peeling Off the Parchment: Polishing completes the above process. It may be done in the huller by screwing it tighter, or in a piece of equipment known as a polisher, which also operates by friction. In the case of Arabica coffee, peeling off the parchment is done at the same time as polishing, but it is impossible to combine both operations when treating other varieties of beans, as the silvery skin clings to the beans too closely. In the case of the latter, it is necessary to treat the coffee in parchment-removers, operating either under dry or wet conditions.

It must be kept in mind that all this equipment operates under strain and that the utmost care must be taken when setting the machines, in order to avoid as far as possible breaking or burning beans, and thus causing serious depreciation in quality.

Sorting and Grading: The purpose of these operations is, respectively, to eliminate waste matter and to produce a uniform and better quality coffee. They may be carried out either by draught or mechanically.

(*a*) *Air-winnowing:* By this method the elements are sorted according to density. Among the main pieces of apparatus in which beans are sorted by ventilation are the density-grader and the "catador". The former is an improved winnower which sorts out the beans into three grades. The latter makes use of draughts under various pressures, dividing the heavy beans from the light. In both cases, only the heavier foreign matter, and stones in particular, are left after the operation.

(*b*) *Mechanical Sorting:* This process consists of sorting the beans according to size by means of a series of oscillating sieves with progressively finer meshes, or by a rotating open-work drum with progressively coarser meshes. This equipment is often completed by a honeycomb-separator which grades the beans according to length. Stones are removed on a slanting table fitted with deflectors, which is shaken violently. The beans are tossed upwards and the stones roll down. For coffee which is grown on red soils, stones may be removed by a magnetic process which satisfactorily eliminates the lateritic nodules with high iron content.

Some varieties of shrub bear uniovular fruits containing round beans known as caracols. These round beans are sorted by means of a caracol-separator, which consists of a sloping travelling band which carries the flat beans upwards, while the round beans roll downwards. The importance of this operation lies in the fact that the caracols have a special value on the market.

Borer-damaged and withered beans have always been the stumbling block in sorting operations because they had to be removed by hand. Great progress, however, has been made only recently in this field. It is at present possible to obtain batches of beans almost entirely free of borer damage by using a set of two rotating cylinders covered with spikes, turning within the mass of the beans to be sorted. The spikes penetrate the borer-damaged beans, which are then thrown out of the machine. Moreover, the problem of removing black beans has been solved by the use of electronic sorting, which grades the beans according to colour. This system is based on the reaction of photographic cells to darkness; on encountering black beans, they automatically operate a trap-door.

Both processes, when extended to common use, will prove most useful to planters in grading their coffee beans.

Packing and Storing: Coffee should be packed in 132 pound sacks according to the requirements of commercial grading. Second-hand sacks should be avoided, as they are often dirty and insufficiently strong. Packing in two coverings is by far the best method, as the coffee is then protected against damp, and the chances of leaking are reduced; moreover, once the outer bag has been removed, presentable appearance is ensured on arrival at the port of destination.

Storage requires perfectly dry warehouses with sufficient space for the lines of sacks to stand a suitable distance apart, touching neither the walls nor the floor.

In order to avoid confusion when unloading, it is useful to classify the bags in lots according to definite grades and to mark and countermark them clearly and visibly. This is the best method of ensuring that the produce of a coffee-plantation is appreciated at its true value.

Requirements of Coffee Processing as Regards Water and Power

For the information of the planter, the average figures given for the various mechanical operations entailed in coffee processing are tabulated below. In order

(*Continued on Page 19*)

A Film Show For Pujoh Besar

By P. J. MERKELIJN

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Government of Netherlands New Guinea

AT the end of June a small party of us visited the village of Pujoh Besar in the Sentani Lake area. The party consisted of B. van der Sluys, M. Kaisiepo and S. Ohee, as well as myself, and the object of our visit was to give an experimental filmstrip show. We wanted to show some slides taken in Noumea during the Second South Pacific Conference, using our Keroscope for projection. In this way we could give information about the Conference, and try out the Keroscope at the same time.

A view of Hollandia, capital of Netherlands New Guinea, where the author of this article is stationed.

We gave no warning of our performance, wanting to take the people unprepared, as it were, so that we should get as natural reactions as possible. We had heard certain diverse reports about them which we were rather interested to investigate, for example: that though appreciating and demanding medical services they would not put themselves out to help native medical assistants in matters of transport; that they were interested in making use of modern mechanical facilities, but had not the knowledge and experience to avoid mistakes; and that though not unfriendly they had become rather sophisticated and offhand in their manner, unlike the people in more remote areas.

We felt that by giving film shows and bringing to the people such information as that on the South Pacific Conference, we would be helping to foster goodwill and trust; and possibly might stimulate initiative and help enlighten the people for their own protection and encourage their confidence in us, so that instead of wasting their money on rubbish or on unreliable equipment, they would bring their problems to the appropriate Government departments and accept the expert help and advice available to them.

The visual aids we took to Pujoh Besar were 58 slides of the Netherlands New Guinea delegation, on the way to New Caledonia, and in Noumea, participating in the Conference; a filmstrip about dental care, another about the work and duties of the Netherlands Police, and a third about New Guinea. These subjects were not necessarily entirely suitable, but were the most suitable we could obtain at the time from a very limited selection.

The trip to Pujoh Besar was made by motor launch, and we had decided that as this was to be an occasion on which the Government came only in order to bring something, we should not expect or ask for anything at all—no canoe, no help with unloading or setting up the equipment. When we arrived at Pujoh Besar we found there was a distance of three feet between the launch and the shore which had to be bridged. Apparently considering it too dangerous to jump, the village schoolmaster and a member of the crew began shouting orders at the crowd, to bring a canoe alongside or to get a bench for us to step on, but we were determined to be independent, and before help had arrived we had made the jump and reached the shore.

We greeted the *ondoafi* (customary chief) of the village, Daniel Monim; the teacher Tulaseket, and the *korano* or village head, Ismael Monim. The latter, who was absent on our arrival, we met later on our first walk round the little island. It was about 2 o'clock in the afternoon when we arrived, and it was very peaceful in Pujoh Besar. Near a canoemaker's workshop five elderly men sat restfully, chatting, their lips red from chewing betelnuts. I joined them and they offered me betel, chalk and sirih. I could not refuse this typical sign of friendliness, and some minutes later I was also sending out fiery red spouts all round me. After a while sitting there, chatting and chewing, it was time to put up the apparatus and screen.

We met with almost every possible setback: the wind was far too strong to enable us to hang the sheet between coconut trees and we had to pin it on the church wall. (We put it there to prevent the people sitting on the wrong side of the screen.) While lighting the lantern, the mantle burned yellow for a very short time; for normal use this would not matter, but to get the brightest light we had to turn the lamp off and clean the glass. While doing this the mantle broke, and we had to let the head cool off and put on a new mantle.

After 15 minutes performance it started to rain. Everything had to be brought into the church in a hurry. Though no one had asked them, everybody helped: the white sheet was pinned on the blackboard, the projector put on the table, and all the people arranged themselves on the benches or on the earth floor. It was only now that we realised how many people were present, which was not evident outside. The whole village had come.

Saul Ohee, my assistant, and himself a man from Sentani, went among the people to listen to their remarks. Before we started, several people said: "Why isn't it a movie, such as is seen in Hollandia?" But these complaints died away when the performance started, and although the South Pacific Conference show lasted for more than an hour,

the interest and enthusiasm remained enormous till the end.

In my opinion, the pictures of the South Pacific Conference were very useful. These began with a shot of the old PH-TCB at Hollandia airstrip, where Inury and Kaisiepo—the delegates—are seen stepping into the plane; the second photo shows the Customs at Biak, and the third is a four-engine plane such as flies between Biak and Sydney. These pictures were in black and white.

Then follows a beautiful series of colour-slides of Sydney — skyscrapers, streets with traffic, the bridge, etc. Then black and white again: our delegation leaving Mascot airfield, where they were photographed in front of the DC-6, together with their fellow-delegates from Australian New Guinea; the arrival of both delegations at Tontouta and Anse Vata (headquarters of the South Pacific Commission); meetings with numerous delegates, first Melanesians (Solomons, Hebrides, Fiji), then Polynesians; the president of the Conference (Monsieur Lassalle-Séré); and in between all these, many photographs of our delegates in the same surroundings.

After this we showed pictures of the delegates on a visit to the village of Gondé, where a feast was held and the indigenes performed welcome dances. There were beautiful colour-slides of the village, the inhabitants and the dances. I imitated the sounds of a ceremonial speech, and asked the audience to join in the performance by approvingly answering "hoi" at appropriate times. This caused great enthusiasm and inextinguishable hilarity. It seemed to me that these pictures were valuable because they showed that it is possible for traditional ways (the dance) to be combined with modern life (the delegates).

Next followed some groups and local scenes, such as the terracing in the hills outside Noumea, and then came the final picture, the Sunderland seaplane starting off with a tail of white foam, on the way back home.

During the performance torrential rain fell. We all stood in the drips from a not-too-well closed roof, and before long a small river began to flood the floor of the church. Those sitting there had to stand up and stay standing for the rest of the evening with their feet in the wet mud, but they continued to show the keenest interest in the performance. Nobody left. It struck us that the women also listened attentively, especially during the story about Tani Sisa and Pa Ariki, the female delegates of Papua and the Cook Islands. Crying children were hushed, and the normal murmur of sounds disappeared completely. They did not miss a word of what was said. It was an excellent opportunity to bring in something about the care of babies and about food, and we took advantage of it, stressing the point that the objects of discussion at this Conference were nothing high-flown, but on the contrary, of great importance to the daily needs of village life.

The reactions to the screening were enthusiastic, particularly when the narrator addressed one of the people on the screen in a cheerful tone and made him answer, reflect, etc.

The children sat in front of the table. Generally speaking, the performance was noisy and it was difficult for the voice to carry into every corner; but the people were interested and it was clear from the way they responded that they could follow my Malay easily. Afterwards S. Ohee gave a short explanation in the vernacular, but there was not much interest.

After an interval, we showed the strips on Netherlands Police and on New Guinea, trying to out-voice the howling wind with our commentaries. The police strip showed many fine old buildings in The Hague, but the strip on New Guinea was not very useful because the photographs dwelt too much on historical curiosities (tree-dwellings, people with penis-sheaths or nose perforations, etc.). These pictures should have been complemented with shots of modern New Guinea such as present-day villagers at work, pupils of schools and vocational training centres, various Papuan officers at their tasks, and so on. The adults were rather restless, and perhaps a little bored and even irritated. The animals were viewed in silence, except the funny face of the kuskus (tree-opossum), which gave rise to great hilarity.

After the show, I talked for a while with the *ondoafi*. On a former occasion, I had asked this man whether it would be appreciated if I gave a "cinema" evening in his village. At the time, he had said doubtfully: "What would the rent be?"

"It would not cost you a cent, *ondoafi*."

"Oh," said Daniel, "a performance in this village would be of the greatest importance for us, sir. Progress, sir!"

We finished the conversation with a question about the purchase of a sporting gun. I gave him information about several makes and calibres and their use, the prices, and the best way to go about buying one.

Formerly Daniel was the village head, but now he has succeeded his father as *ondoafi*. He has a thriving business in coconuts, which he trades for money or 200-litre drums of kerosene, needed for the pressure lamps in his village.

People were, as many of them said, very happy with this evening. The *ondoafi's* first question was to ascertain when I would be back. But when I asked about the possibilities of being transported by canoe in such a case, he dropped the subject.

We found the Keroscope quite useful. It is very well made. The pictures are not as bright as those provided by an electric projector, but nevertheless everyone can see them clearly, even in distant corners. The Keroscope's biggest asset is its lighter weight, which means that one carrier can bring the complete apparatus along, together with an amount of fuel sufficient for two weeks' daily showings. One difficulty is the escape of light downwards and backwards, which is sometimes annoying to spectators who are sitting to the back of the projector.

Though our purpose in giving the film show may have been a little vague, we felt that we had made a beginning in the right direction. We had made our little experiment for several reasons—to foster goodwill and confidence, to give our equipment a test under typical conditions, and to find out something about the people.

Our conclusions were not disheartening. We found interest and even enthusiasm for the information we had brought; our equipment proved adequate and, as regards the reports we had heard of the people, we felt that we should not be sceptical about all the "excesses" and "materialism" we had been told about (guns being considered more important than medical assistants, and so on). These are healthy signs, for in any country the creation of a more comfortable and easier life is a strong incentive for progress.

With trial and error, the people will learn the inter-relation of modern conditions, and perhaps our experiments in the Sentani villages may have started the thought that help in that process is available; the realisation that the Government is there to assist them, not by imposing its will, but as a trusted friend.

CORRESPONDENCE INVITED

The "SPC Quarterly Bulletin" is a magazine to serve the interests and needs of Pacific Islands people. Readers are cordially invited to contribute letters on topics of general interest to its columns. Photographs will also be welcomed (prints and/or negatives will be promptly returned after use).

Correspondence should be addressed to:

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SYDNEY, AUSTRALIA.

Above: Indonesian fishermen pickling fish in a canoe. The brine may be used for three batches if salt is added each time to maintain the original concentration. Right: Dry-salted flying fish being laid out on bamboo mats for sun drying.

Simple Methods Of Fish Preservation

By H. VAN PEL*

Those concerned with the preservation of fish who lack modern preserving equipment will be interested in the methods of fish curing described in this article.

IN some islands, more fish is caught at times than can be consumed. Methods are described below of keeping the surplus fish in good condition for later consumption. Again, fishermen sometimes cannot return to their villages promptly with fresh fish they have caught, and it will be of value to them to know how to preserve their catch by simple means.

All the methods described in this article have been tested, and are used even for commercial purposes.

There are four main techniques of fish curing for which simple means can be used. They are salting, drying, smoking, cooking. Combinations of these four techniques can be used. For instance, fish can be first salted and then dried, or it can be salted and smoked, or again it can be cooked and dried, etc.

Salting

There are many different kinds of salt, some being better than others for fish curing. However, in islands or in outlying places there is often no choice, and whatever is available in the way of salt has to be used, whether it is bought in a shop, prepared on the spot, or extracted from earth containing salt.

A distinction must be made between the two chief techniques of salting: wet salting and dry salting.

Wet Salting: This is the cheaper, since it requires lesser amounts of salt. The principle is to keep the fish for a long time in brine.

The equipment needed consists of a watertight container, which can be a tin, drum, canoe, barrel, etc. To make the brine, one takes four parts of clean water (sea or fresh water) and one part of salt. If the salt is coarse, it has to be ground or pounded first. It is then dissolved into the water by stirring with a piece of wood. To be good, the brine must float a fish.

The next step depends on what kind of fish one wants to salt. It is best first to cut off the head, and gut and clean the fish, though small fish can also be salted whole. Large fish must be cut open, and it is preferable to take out the backbone. Fish with a heavy armour of scales must be scaled. In places where the flesh is thick, slashes must be made so that the salted brine can penetrate the flesh. Very large fish should be cut in thin fillets.

After the fish has been prepared

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according to its size, it must be cleaned and put in the brine. A plank or matting is laid over it and weighted with rocks so that the fish is entirely covered with brine.

This salted fish can be kept for a long time in a dark or at least a shady place. The remaining brine can be used three times, but water and salt must be added every time until a fish can again float on the liquid. In any case, fresh brine is always best.

Dry Salting: In this method the fish is salted but the juices, slime and brine are allowed to flow away. Dry salting can be done in an old canoe, or on mats, leaves, boxes, etc. In any case, the brine formed by the fish juices and the salt must be allowed to run away. For two parts of fish, one needs one part of salt. Layers of fish must be separated by layers of salt. It is a valuable method when one has no containers. This method is used to salt down flying fish in open fishing boats while at sea, and the fish in this case are kept whole.

Some people like the salty taste of fish prepared in this way, but it is always possible to wash the salt away by soaking it in fresh water before use.

Drying

Very small and thin fish can be dried straight away in the sun if they are brought in early enough in the morning (and if, of course, the sun is shining!). If these conditions are not fulfilled the fish must be put for one night in brine, or dry salted. They can then be dried the next morning. If it happens to be raining the next day, it is necessary to wait until the weather has cleared up, which could take from a few hours to a couple of days. In this latter case it will be necessary to wash the salt away from the fish by soaking it in fresh or sea water for a couple of hours before drying it; this depends again on the tastes of the consumers and on the purpose for which the fish is cured.

Small fish are mostly sun dried on mats, or suspended. When it rains the fish must be kept dry by covering or transferring them under shelter. If fish are laid on mats or other material to dry, it is best to turn them over every two hours so that they will dry quickly and not become maggotty. In the case of large fish, hanging is better if they are merely split.

Dry salted fish can also be dried, but they should first be cleaned in water.

Normally the fish will be dried after three days. If a great quantity of fish has been dried and is to be kept for some time, the best way is to pile it up in a dark place, off the ground and preferably on wooden boards. It should then be covered with a sack or mat. After a fortnight the fish should again be laid in the sun for one or two hours and then put away as before.

These are only indications of the main principles of fish drying; variations are possible.

Smoking

Any kind of fish can be smoked. There are three main methods of smoking:

(a) Smoking and roasting;
(b) hot smoking;
(c) long smoking.

Smoking and Roasting: This is a simple method of preservation, for consumption either directly after curing or within twelve hours. Re-smoking and roasting can keep the product in good condition for a further twelve hours. Fresh unsalted fish is put over a wood or coconut husk fire. This should be kept very small and the fish turned over every five minutes. In about half an hour the fish is ready for consumption or, if it is the intention to keep it for a while, it should be put in an aerated container.

Fish can be preserved in this way even in open fishing boats, but the smoking has to be done in a tin or a half-drum. Salted fish can also be smoked by this method, but this is used mostly for immediate consumption or in order to bring the produce in smoked form to a nearby market.

Hot Smoking: The hot smoking system can be used for immediate consumption or to keep the fish for a maximum of 48 hours. Small fish can be salted first for half an hour (see wet salting). After salting they are put on iron spits and dried in a windy place or in the sun for another half hour.

It is necessary to have an oil drum to make the smoking stove. The top of the drum is cut out and holes are made 8 inches below the rim to place spits. Near the bottom a rectangular opening is made to control the fire. This opening should be closed with a small door or piece of steel plate.

A fire of hardwood or coconut husks is made in the stove, and once it is well started it is regulated so as to give no flames. The fish are then placed over the spits. During the smoking operations the top of the drum must be covered with a sack or with palm fronds laid as close together as possible; the fire control opening should also be closed. The fire must be watched from time to time. The fish will be ready in about one hour. An indication that they are done will be found in the golden yellow colour of the skin.

For big fish, 1½ to 2 feet long, the best method is to split them in halves, to the right and left of the backbone. Each half fish is fixed between two flat bamboo slats or sticks. These halves are then rested head down on racks built four feet above ground. A number of split fish can be lined up next to each other.

A fire of hardwood or coconut husks, or several separate fires, are then lit under the rack. The number of fires depends on the quantity of fish one has to smoke. There should be a slow fire for about half an hour followed by a brisk one for one hour. A small fire is then kept going for six hours (just smoking).

After this treatment the fish is ready for transport and will keep in good condition for two to three days under tropical conditions. This method is used in particular in the Celebes for skipjack and other tunas.

Long Smoking: If fish must be kept in good condition for a long time, for instance, two or three months or even longer, it can be done by smoking, provided the fish is not oily.

For this purpose, a small closed shed made of palm leaves or other local material can be used. The dimensions of the shed depend, of course, on the quantities of fish to be smoked, but the height should in no case be less than six feet. In this shed, racks are built to hang the fish from or to lay them upon. Hanging the fish on spits is the best method, but they can also be laid on loosely-woven matting. One can start hanging fish three feet from the bottom up to the roof.

The preservation of fish is effected by smoke only in this method, and it is best to use coconut husks which should burn very slowly so that the fish is dry-smoked after 48 hours. After such a treatment the flesh is dried throughout.

If it is necessary to transport these fish to other islands, they should be packed in small packages wrapped in dry leaves and reinforced with bamboo or sticks.

In Eastern Indonesia, packages of smoked fish are sent over great distances; these are mainly garfish.

Cooking

Fish can be kept for two or three days in the following way:

Small drums (possibly oil drums) are cleaned and filled with water. Salt is added in the proportion of four parts water to one of salt. Small oblong or round baskets made of bamboo or leaves are filled with fish, and as many baskets as possible are put in the drum. Care should be taken that the top baskets are fully covered.

A fire is lit under the drum and the water boiled for about half an hour before the fish is well done. The baskets are then taken out and the water drained off. The fish can then be transported in the baskets. The water may be used three times for cooking, but more water and salt must be added each succeeding time. By evaporating the remaining

(*Continued on Page 19*)

SAGO

The fourth of a series of articles on subsistence food plants in the South Pacific*

Prepared by

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Sago Palm.

SAGO starch is extracted from the stem of certain plants, particularly of various palm trees, the main ones belonging to the genus *Metroxylon*. In the South Pacific, notably in Melanesia, they form the main vegetation of the swampy forests which spread over extensive areas of the lowlands of New Guinea. In these inhospitable regions, the limited area above water makes it impossible for the islanders to grow sufficient subsistence crops for their needs; the bulk of foodstuffs is provided by sago.

Metroxylon sago palms grow to a height of between 30 and 50 feet, with a trunk diameter of between 20 and 30 inches. Each tree produces only one inflorescence during its life cycle; this forms around the fifteenth year in an enormous raceme rising straight up from the top of the tree. It is to ensure this late fructification that the large stocks of carbohydrates, used by man for food, accumulate inside the trunk. Each tree dies off after bearing fruit, but the root stock gives out several new shoots. Natural sago groves are thus extremely dense.

From the botanical viewpoint, some confusion seems to exist between the various types of *Metroxylon* described to date. Certain botanists, indeed, believe that the distinctions made are perhaps far from completely valid and that many are synonymous. Thus, *Metroxylon Rumphii*, Mart., which has a thorny foliar sheath, and *M. Sagu*, Rottb., with a smooth sheath, the two species most frequently used for their starch content, have often been considered as two varieties of the same species. Indeed, seeds taken from either one of these trees might produce either smooth palm trees or thorny ones. Among the Marinds in Netherlands New Guinea the memory has been preserved in native tradition of natural groves of thorny sago palms which have gradually become smooth through the empirical selection practised by the natives.

These reservations having been made on the botanical score, here are a few of the species of *Metroxylon* to be found in the South Pacific:

In New Guinea: *Metroxylon Rumphii*, Mart., *M. Sagu*, Rottb., *M. oxybracteatum*, Wav. ex K. Schum.

In the Solomons: *Metroxylon bougainvillense*, Becc. et *M. salomonense* (Warb.), Becc.

In the New Hebrides: *Metroxylon Warburgii*, Becc.

In Fiji: *Metroxylon vitiense*, Benth. & Hook.

In Samoa: *Metroxylon upolense*, Becc.

In fact, it is only in New Guinea and the neighbouring islands that varieties of *Metroxylon* are actually used for their starch content. In the other territories where these palms exist, it is possible that their use as a food was discontinued as far back as the earliest times. Guppy[1] believed that the use of *Metroxylon vitiense* as a subsistence food was lost in this way in Fiji. In the New Hebrides, where people know only through tradition of this use of sago as food, today one comes across varieties of *Metroxylon* grown for their leaves only, which are used in house building. It is possible that at some distant epoch the *Metroxylon* group, whose centre of origin spreads from Malaysia to New Guinea, was transported by men right to the borders of what is at present known as Polynesia.

The islanders use the natural groves and grow sago palms propagated by

* Earlier articles have appeared on **Taro** (October, 1953), **Yams** (July, 1954) and **Breadfruit** (October, 1954).—Editor.

Left: A sago grove in the swamps of southern Netherlands New Guinea. Second from left: The pith is removed from the trunk by grating and crushing with a kind of adze, of which the cutting section is a piece of bamboo with sharpened edges. Near Merauke, southern Netherlands New Guinea. Second from right: Washing the sago in a sloping trough, made from a leaf stem of Metroxylon. Washing is accompanied by energetic threshing. As it runs out the liquid filters through a piece of fibrous spathe. Marind, southern Netherlands New Guinea. Right: Another method of washing, with kneading by hand.

seedlings and shoots. Eight to fifteen years are required before the palm tree is worth felling, as it is just before flowering that the reserves of starch stored in the trunk are at their maximum. To prevent flowering exhausting these reserves, the Papuans occasionally remove the bud. Naturally sterile palm trees which accumulate enormous stocks of starch in their trunks are also found: as much as 900 lbs. of crude sago has been extracted from such palms. This, however, is exceptional; the average yield is very much lower. Mr. Zwollo, who studied the question recently in Netherlands New Guinea and to whom we are indebted for much of our information on the sago palm, puts it at between 250 and 350 lbs. per tree.[2]

In a normal swampy forest grove 25 palm trees can be found per acre per year which are worth felling; this production, amounting to between 6,250 and 8,750 lbs. of crude starch with a water content of between 35 and 40 per cent., represents between 7,000,000 and 9,900,000 calories. *Metroxylon* yields, however, vary considerably; certain varieties are particularly poor in starch, and it is possible to find dense groves of *Metroxylon* containing only trees with very low sago production.

In a given area of swampy forest, the local people can pick out a number of varieties of sago palm; thus the Marinds in Netherlands New Guinea distinguish at least eight smooth or more or less thorny varieties with added variations in size, colour, growth and starch yield.

After felling, the bark is removed from half of the sago trunk; and the pith is removed by grating and crushing with a kind of adze of which the cutting section is made of rough stone, hard wood, or, more often, from a piece of sharpened bamboo. To-day, where there is contact with the Europeans, a section of metal piping with sharpened edges is a frequent substitute for the wooden or stone tool.

The crushed pith is washed in an inclined trough, made from a leaf of the sago palm. This process is accompanied by threshing with a lath or by kneading by hand. The liquid containing the starch runs into the trough and filters through a fibrous spathe arranged for this purpose. It is collected in draining pans made from portions of the palm: leaves, leaf stalks, etc. The drained sago is then dried partially.

To preserve it, it is wrapped in bundles in palm leaves. These bundles vary in form and are most often cylindrical or conical. If the sago is intended for family consumption only, they are more or less shapeless. Those intended for barter, however, are prepared with particular care. Thus, in New Guinea, the natives hollow out cylindrical holes in the fibrous residue left from the washing process and line them carefully with green *Metroxylon* leaves. They then heap the fresh starch into the hole, using it as a mould; then wrapping the leaves over the top, they remove the package and bind it fast.

Bartering of sago gave the marsh dwellers in New Guinea the opportunity to procure a number of articles which they lacked: pottery, tools, smoked fish and other foods, notably tubers. This trade entailed real sea-going expeditions such as those made by the natives of the Port Moresby district coming to acquire supplies of sago in the Western deltas. Even to-day, intensive canoe traffic continues to ply between the islands in the Geelvinck Bay and the Waropen marshes in Netherlands New Guinea.

Industrialized cultivation and commercialization of sago would afford a desirable improvement in the living conditions of natives inhabiting the swampy forests where economic possibilities are limited. In fact, although the starch produced by native methods is impure, it might well become an export product. In 1950, the United States imported approximately 6,000,000 pounds of Malayan or Indonesian sago.

In order to preserve the sago they produce, the natives find it sufficient to keep it damp in a covering of leaves, sprinkling it with water from time to time. Where pottery is known, the fresh sago is merely placed in a large jar and covered with water. In some cases, a sago paste is made into briquettes which are dried rapidly on the surface over a fire; these briquettes will keep for about a month. As a general rule, Papuans find that when sago is completely dried it loses its flavour. They consider the starch prepared by European methods as being practically uneatable.

An examination of a number of food composition tables shows that sago consists almost entirely of starch and water. The protein content is very low, in the region of 0.2 gr. per 100 gr.; fats are completely absent. Mineral salts are only present in very small quantities (ashes, 0.35 mgr. per 100; calcium, 10 mgr.; phosphorus, 12.5 mgr.; iron, 1.5 mgr.). There are practically no vitamins. It is possible that the fermentation process which develops when sago is preserved in the wet state increases the vitamin B content. The water content of sago varies considerably with the samples analysed; it depends on the methods of preservation used by the natives. The calorie value varies in relation to the water content and should be calculated according to the starch content of each sample.

In the South Pacific Commission laboratory in Noumea, Mr. Frank Peters analysed seven samples of sago, or preparations made from sago, from Netherlands New Guinea. Three samples require further analysis for checking; only the results obtained for four samples and, in each case, the value of the constituent elements of the fresh and dried product, per 100 grammes of the product, are given here.

Left: Bundles of crude sago on the native market at Lae, Australian New Guinea. Second from left: Jar for preserving sago. Lake Sentani. Second from right: Sago briquette. Marind. Right: Sago paste mixed with grated coconut, known as "Sagoe sep" in Malayan, cooked in half a coconut shell in an oven of hot stones.

ANALYSES OF SAGO AND SAGO PREPARATIONS

Raw sago

	Water.	Fats.	Starch.	Soluble Sugars.	Ashes.	Fibre.
(a) Fresh	26.4	0	71.6	0	0.2	0.4
(b) Dried	—	—	97.4	—	0.25	0.55

Sago "ega"

Method of preservation in briquette form, wrapped in plaited sago leaves.

SAMPLE No. 1	Water.	Fats.	Starch.	Soluble Sugars.	Ashes.	Fibre.
(a) Fresh	37.4	0	50.0	0.6	0.4	1.8
(b) Dried ..	—	0	79.9	0.95	0.65	2.9
SAMPLE No. 2						
(a) Fresh	52.4	0	39.7	0.4	0.4	0.6
(b) Dried .	—	0	83.4	0.85	0.85	1.25

Sago "sinole"

Common preparation made from a mixture of sago and grated coconut, shaped into a flat cake and baked.

	Water.	Fats.	Starch.	Soluble Sugars.	Ashes.	Fibre.
(a) Fresh	22.9	16.3	58.8	0.5	0.4	1.0
(b) Dried .. .	—	21.5	76.2	0.65	0.5	1.3

These results call for no particular comment. They indicate clearly the variations in water content of sago preserved according to native methods, and coincide with results already known.

Sago can only supply energy needs. In swampy regions of New Guinea where sago is the staple food, the average daily ration for an adult is about 2 lbs. This ration varies, according to Mr. Zwollo, from between 1½ to 3½ lbs. of raw sago and represents from 1,700 to 4,000 calories. It is considered that, in order to satisfy its needs, the average family must spend around 10 days per month in sago groves.

Sago is an unbalanced foodstuff and must necessarily be supplemented. Within the ecological environment of the New Guinea swampy forest, animal and vegetable protein, fats, minerals and vitamins are supplied by foraging, in which *Ipomea aquatica* leaves and other greens take the foremost place, and by fishing and hunting. Fresh vegetables are grown on platforms, or in the gardens planted on the limited areas above water. On the edge of the swampy forest or in savannah districts dotted with sago swamps, the diet is supplemented by tubers, roots, greens and pulses from the garden; and by the coconut and hunting.

Sago is eaten in various ways:

Where pottery is known, a sago porridge, accompanied by condiments and greens, fish, shellfish or wild meat, is the most popular form.

Where pottery is not known, a kind of cake is generally made by cooking a sago paste, occasionally mixed with grated coconut, greens, fish or meat, in an oven of hot stones. This paste is cooked either rolled in green leaves, or in half a coconut shell, or else in a section of bamboo.

In districts of Netherlands New Guinea where pottery is used, a kind of biscuit, known in Malay as *sagoe lempemg*, which is easily preserved, is made in an earthenware mould which serves as an oven.

Thus, by exploiting natural plantations of sago palms or cultivated palms, the dwellers in the swampy forests of New Guinea obtain this energy food which is the basis of their diet. Through barter, moreover, sago makes it possible for them to acquire a limited quantity of goods, local or imported, which are becoming daily more necessary for their existence in this ill-favoured area.

It is scarcely possible to increase the food value of sago; supplementing of the diet seems to be reasonably assured by the natural resources. The living conditions of the swampy forest peoples might benefit, at least within certain limits, from industrialization on the village scale and from marketing of sago. A detailed survey of the possibilities for co-operative exploitation, for instance, of preservation processes and of both the domestic and export markets might clarify the possibilities of supplying the needs essential to the development of the area.

Bibliography

GENERAL:

RIDLEY: *Sago.* "Agricultural Bulletin of the Malay Peninsula", 1895.

REYER: *Der Sago.* "Tropenplanzer", 1901.

DEINUM: *Sago.* "De Landbouw in de indische archipel", Vol. II a, 1948.

SAGO IN SOUTH PACIFIC TERRITORIES:

RILEY: *Sago Making on the Fly River.* "Man", Vol. 23, No. 10, 1923.

LEWIS: *Use of Sago in New Guinea.* "Field Museum of Natural History", Leaflet No. 9, 1923.

SAGO FROM THE INDUSTRIAL VIEWPOINT:

WYRZBURG: *Root Starches (Including Sago) Other than Those of White and Sweet Potato.* "Economic Botany", Vol. 6, No. 3, 1952.

[1] cf. H. B. GUPPY, *Observations of a Naturalist in the Pacific between 1896 and 1899*, London, 1906.

[2] Mr. Zwollo has produced, for the use of the Netherlands New Guinea Administration, a remarkable study, unfortunately unpublished, entitled *Sagoe Onderzoek*, devoted to the sago palm and its use.

Biological Control Of The Rhinoceros Beetle

Commission Entomologists Carry Out Investigations In East Asia And Samoa

By L. J. Dumbleton

Plant and Animal Quarantine Officer, South Pacific Commission

The problem of controlling the Rhinoceros Beetle (Oryctes rhinoceros) *in South Pacific territories is actively engaging the attention of the South Pacific Commission which in May 1953, embarked upon a comprehensive research project in relation to this major threat to the coconut palm in the South Pacific.* The Commission has had two entomologists working in the field since early in 1954. Dr. R. A. Cumber in Western Samoa is studying beetle ecology in relation to control. Mr. T. V. Venkatraman in India and South-East Asia is concerned with biological control, which involves the survey and evaluation of natural control factors affecting the beetle in that area with special reference to parasites, predators and diseases and the collection, breeding and shipment to the South Pacific of those which show promise.*

THE search for parasites and predators which may be of use in controlling the Rhinoceros beetle in the Pacific was started in the India-South-East Asia area because that is the original home of the beetle. Later it is intended to investigate conditions in East Africa and adjacent islands where there are numerous closely related species of *Oryctes*, though *Oryctes rhinoceros* itself is not present.

Mr. T. V. Venkatraman, the entomologist who was appointed to carry out this work, has now completed the first stage of his work in South India. The next stage will be a similar investigation in Ceylon, and this will be followed by work in Assam, Burma and Thailand.

The initial phase in such work consists in a survey of the insects and other organisms which are present in association with *Oryctes*, more especially in its breeding places. Naturally the interest is concentrated on those parasites, predators and diseases which appear to be capable of limiting the numbers of the beetle.

The area in South India which has been investigated consists of Travancore-Cochin State and the Malabar and Kanara areas of Madras State and parts of Mysore State. The work was commenced here because this is the largest single coconut-growing area in India, and climatically is perhaps as near an approach to Pacific island conditions as can be found in India.

In some respects the conditions in that area are markedly different from those in the Pacific. The great density of the human population leads to extremely close utilization of the land and of the products of the land. Coconut plantations, which are mostly in small units of one or two acres, are very carefully tended and usually cultivated and underplanted with tapioca, etc. Forest and jungle areas, except in the inland parts, are absent or much modified by man, and in general there is so little dead wood of coconut or other trees that the breeding place most commonly available to *Oryctes* is in the heaps or pits of cattle manure.

Inasmuch as any parasite which is to be successful in controlling *Oryctes* under Pacific conditions must be one which can search for and destroy it in the dead wood of coconut and broad-leafed trees, special attention has been paid in the survey to the parasites and predators existing in dead coconut logs, whether standing or fallen and in dead wood in jungle areas.

While in South India, Mr. Venkatraman made his headquarters in Trivandrum, the capital of Travancore-Cochin State. Much invaluable assistance has been rendered him by departmental officers of Travancore-Cochin and Madras States, by the Coconut Research Stations at Kayangulam and Kasaragod and by the University of Trivandrum. From Trivandrum he has worked 50 miles south to Cape Comorin and 500 miles north to Coondapoor (about half way to Bombay) and 100 miles inland to Hiriyur in Mysore State. In addition to coconut areas work has been done in wild date palm (*Phoenix dactylifer*), Palmyra palm (*Borassus flabelliformis*) and talipot palm (*Corypha umbraculifera*) areas. Some of the more promising sections are not so much in the low-lying coastal backwaters which are very heavily populated, but in the inland foothill country, less heavily populated and adjacent to relict forest areas.

In the course of this work many animals, other than insects, which are undoubtedly predators on *Oryctes* have been encountered. Thus crows, squirrels, bandicoots, mongoose, snakes and lizards, prey on *Oryctes* larvae in manure heaps, while in dead standing coconut trees, snakes, lizards, centipedes, millipedes and molluscs play the same role. Because of their venomous nature or the unpredictable nature of their behaviour when introduced to a new environment, none of these could be considered for introduction to the Pacific.

The chances of finding parasites or predators which attack the eggs, larvae and pupae are greatest, but there do exist parasites of the beetle itself. Mr. Venkatraman investigated a Sarcophagid fly which had previously been reported as a parasite of the adult beetle. In about 600 beetles collected, he found about 5 per cent. parasitised. This low rate of parasitism, coupled with the fact that the fly frequents manure heaps and cattle sheds, does not make it promising as a subject for possible introduction.

The common Green Muscardine fungus attacks the larvae, and there is some evidence of bacterial diseases which are being investigated with the co-operation of the Bacteriologist at the University of Trivandrum.

A Reduviid bug (or Assassin Bug) has been located inside the bark of dead standing coconut trees. In the laboratory it feeds on eggs and young larvae of *Oryctes*, but it is not very common in the field.

The most promising predators so far are two beetles. One is a large Elaterid or Click Beetle larva which reaches 5½ inches in length. It is found throughout the area, though nowhere in very great numbers. It is found in most types of breeding sites, including manure heaps and dead standing coconut logs. The other is a large bluish Carabid beetle which is presumably predacious in both the beetle and larval stages. This also has been found inside the tunnels of *Oryctes* larvae in dead coconut trunks.

So far no evidence has been seen of the existence in India of any large parasitic Scoliid wasps attacking the larvae of *Oryctes*.

Only observation, experiment and judgement can assist in determining which are the species most important in

* An article describing the Commission's Rhinoceros beetle research programme appeared in **S.P.C. Quarterly Bulletin**, Vol. 4, No. 2, of April, 1954. EDITOR.

A young palm with fronds badly chewed by adult rhinoceros beetles. Locality, Vunairima Methodist Mission, North Coast Road, New Britain.

the control of the beetle and most likely to succeed in the Pacific. It is not desired to make a choice of parasites or predators for shipment to the Pacific until the preliminary survey has been made in at least some of the other areas in India and South-East Asia, when the choice can be made with a better knowledge of what is available over a wider area. In the meantime, however, information is being accumulated on the habits of some of the more promising species and the collection areas and the methods of collecting and handling these insects if it should be decided later to ship them to the Pacific.

Coffee Processing

(*Continued from Page 10*)

to give a clearer idea as regards production and power, the hour has been taken as the work unit.

Operations	Production in lbs. per hour	Power per hour (h.p.)
Pulping	9,700	2
Peeling off the parchment	1,300	10 – 12
Hulling the berries	749	10 – 12
Sorting	661	3
Grading	881	¾

As regards the water supply required for the wet method of processing, the grower will find it technically sound to multiply the weight of green coffee to be obtained by 10. For example, in order to obtain 1 ton of commercial coffee he will need to use 10 tons of water, or 13.08 cubic yards. This average may be increased fivefold without risk, but it could not be reduced by as much as two-thirds without jeopardizing final production. It must never be forgotten that the greater the quantity of water, the greater the chance of success when processing coffee by the wet method.

Coffee, it should be stressed, is a rich product whose future is largely dependent on quality. It is on this aspect that growers in the coffee-growing areas of the South Pacific should primarily concentrate their efforts. Effective results would be encouraged by well-directed agricultural propaganda, a policy of strict grading and incentives to the producers of higher grades of coffees. It is only by granting preference to the better qualities that a higher all-over quality will be obtained.

The coffee beans of the South Pacific generally have flavour and aroma peculiar to the region which cause them to be classified as "improving varieties". If attractive appearance were added to this rare privilege, the market prospects for coffee production in the South Pacific would be virtually assured.

BIBLIOGRAPHY

Le traitement du café et son materiel, par Maurice Peiliard — Marchés Coloniaux du monde. Juillet 1952.

Le Café. Production—Préparation—Commerce, par A. Fauchére. Societe d'éditions géographiques maritimes et coloniales. Paris. 1930.

Notes sur la préparation du café, par A. Ringoet. Serie technique de l'Institut National pour l'Etude Agronomique du Congo Belge.

Fish Preservation

(*Continued from Page 13*)

water over a fire or in the sun, a good fish paste can then be obtained.

Fish can also be cooked in coconut water, but without salt. If there is not enough coconut water available, grated coconut can be added. The fish are put in baskets and cooked as described above. After cooking, the flesh is separated from the bones and is pounded and dried on mats in the sun (when the sun is not shining, the pounded fish can be dried over a fire). For this purpose steel plates, which can be made from flattened drums, are placed over a small fire. Mats of bamboo or other material are laid over the plates and the pounded fish is placed on the mats to dry. Fish cooked in this way should be thoroughly dried. The result is an excellent fish meal suitable for human consumption and retaining an excellent coconut flavour. This meal can be kept for six months in a dry place. It is ready for consumption, but may also be used for fried fish cakes.

The bones of fish prepared in this way can also be crushed, and provide excellent pig food; the entrails of the fish are also very good food for pigs.

Before concluding this article, I wish to stress that for almost every locality methods can be devised for keeping fish for some time. Many other preservation techniques than those described can be used. Anyone desiring further information on the subject is invited to write to the South Pacific Commission, Noumea, New Caledonia, giving details of conditions in his locality.

QUARTERLY BULLETIN and PACIFIC READING To be Amalgamated in July

The two quarterly magazines issued by the South Pacific Commission, the *Quarterly Bulletin* and *Pacific Reading,* are shortly to be combined in one publication under the title of the former.

Pacific Reading is published by the South Pacific Commission Literature Bureau, established by the Commission to stimulate provision of literature and visual aids for island peoples. Each issue records information from the Pacific area about work being done there in the preparation, distribution and use of new literature and visual aids.

It is intended that the amalgamation of the two magazines will take effect from the July issue of the *Quarterly Bulletin.* Subscribers to *Pacific Reading* whose subscriptions have not been exhausted by that date will have them applied to the *Quarterly Bulletin,* without extra charge. Alternatively, the amount involved will be refunded where readers so desire.

Above: Taking a small patient to a ward in the hospital on Ponape.
Right: A patient in the operating theatre.

Nursing In Micronesia

This article describes the problems of training health workers to serve the 57,000 people of Micronesia, speaking nine different languages, who inhabit over two thousand islands scattered over three million square miles of Pacific Ocean.

By RUTH INGRAM

Nurse Education Supervisor, Public Health Department
U.S. Trust Territory of the Pacific Islands.

MODERN nursing in Micronesia is in its early infancy*. No barriers of tradition block its development. It can grow into a pattern which will fit the needs of this vast area of the Pacific Ocean, but whether the individual produced according to that pattern should be called a nurse, or should be given some other title, is still an open question.

Why do health workers in Micronesia need a different preparation from those in Britain, Europe or America? A glance at a map gives a partial answer. Micronesia is made up of 2,148 islands and islets with a total land area of only 902.5 square miles—considerably less than the State of Rhode Island. These are scattered over three million square miles of the Pacific Ocean. About 57,000 people live upon them.

The islands are isolated from each other and the rest of the world by distance and also by lack of communication. Once in two or three months a Trust Territory ship stops at each inhabited island to load copra and unload trade goods, and a doctor or member of the district hospital staff visits the local dispensary to replenish the small stock of drugs and other medical supplies and to see what patients he can. All the rest of the time, the people depend on their local health aid or upon native doctors for medical attention.

Fortunately most of the people are healthy and well-nourished. The terrible scourges of Asia and other parts of the world have never reached these far-off bits of land. Even measles and malaria are unknown. The women seem to have their babies rather easily, and with few complications. Midwifery is practised by untrained women—usually the mother or a female relative of the patient. Babies are breast fed, and most of them are fat and happy infants.

But even in this island paradise, certain diseases are common. The incidence of tuberculosis is high all over the Trust Territory. Leprosy is common on some islands, filariasis on others. Most children are infested with intestinal parasites —all these conditions could be improved or prevented by sanitation and teaching the people health habits, but sanitation is also in its infancy and thus far there has been no one capable of health teaching.

Role of the "Health Aids"

The health aid is usually stationed on his native island. He runs a small dispensary where he gives out a few simple drugs and cares for minor injuries. In most cases his training has consisted of a few months spent in the district hospital, where he has picked up some knowledge about the treatment of the commoner diseases. Plans are being made to give these men a three-month course, in fact two or three groups have already been taught. A few of the older health aids received some training from the Japanese or American Navy doctors and are able to give more service to their people. But the majority of the islanders receive little treatment in acute illness.

The District Hospitals

Each of the five districts has a small 45-70 bed hospital (about one-half of the beds are occupied by tuberculosis patients). An American-trained physician is in charge, assisted by indigenous medical practitioners trained in Suva.

These hospitals operate under great difficulties. The nursing staff consists of a few Micronesian nurses trained in a School of Nursing established by the Navy in Guam after the war. (This school has now been closed.) Most of the bedside nursing is done by nurse aides, women, supplemented by the health aids, men. Equipment is adequate but supplies of linen and drugs are limited. Important drugs such as penicillin and streptomycin must be used carefully. Our most urgent needs are supplied by the

(*Continued on Page 32*)

It will be noted that the term Micronesia is used throughout this article as synonymous with the Trust Territory of the Pacific Islands, and does not include the Gilbert Islands, etc.—EDITOR.

Population Study of the Marind-Anim

By S. KOOIJMAN

Dr. S. Kooijman, leader of the team.

Studies of Pacific islands populations are prominent in the Commission's work programme. The first pilot investigation into problems of over- and under-population has just been completed among the Marind-Anim people of Netherlands New Guinea. It was carried out in association with the territorial administration, and with the Leiden Museum, which lent the services of Dr. S. Kooijman, leader of the project team.

THE object of this pilot investigation in the Marind-Anim was "to discover the medical and/or social causes of the continued depopulation among the Marind-Anim people, giving special attention to methods required for further investigation of depopulation in other areas of the South Pacific".

The Marind-Anim, numbering roughly 8,000, live in a great number of villages spread along the south coast of Netherlands New Guinea, from Frederik Hendrik Island in the west up to about half the distance between Merauke and the border of the Australian part of the island. There are also some groups living inland, along the banks of the big, slowly-flowing rivers of Kumbe and Bian, while the hinterland of the western coastal district shows some scattered Marind settlements.

The shores where the coastal-Marind live are ideally situated for habitation. Coconut palms, which have always constituted the main wealth of the Marind, grow on the high sandbanks; there are sago palms behind the shores, in the marshy lower regions. During the rainy season—from December till May—people live dry along the coastal district, while the greater part of the hinterland is flooded and is impassable and uninhabitable. In the dry season, when the strong southwesterly winds blow, many of the coastal inhabitants go hunting into the now dry hinterland. Those staying on the shores live behind protecting windshields made of palm-leaves.

People live on sago and coconut, and on what is yielded by the hunting and fishing seasons, restricted to a certain time of the year. They also make gardens by raising beds high. In the rainy season these gardens stand out over the flooded areas like little boats, and are therefore also called *javun* (boats). What the gardens yield is consumed in great quantities during festivities. The wati plant (*piper methysticum*) is grown with much care and the liquid obtained by chewing its stem is then used for enjoyment.

The Marind culture fits into the larger framework of Papua cultures on the south coast of New Guinea. Thus we find that they, just as the Elema described by Williams, have extensive dramatic festivities. In the course of these festivities, which as a rule last for several consecutive months, the great events of primeval ages, as told in their myths, are shown. Fantastically decorated players re-enact in their play the great work of creation of the *demas*, the demi-god of primeval ages. Both for players and spectators this was much more than a play, it was creation itself being repeated, which indeed had to be repeated if the Marind people wished to survive. There was a series of ritual promiscuities, enormously comprehensive, inseparably connected with these festivities. This ritual sexuality—this "sperma cult" as Dr. van Baal, one of the best authorities on the Marind religion has termed it—is the very core of the old Marind life.

The Marind were also well-known head-hunters and their expeditions, too, meant much more than just a cruel and exciting game. Their victims were found in the non-Marind inhabitants of the hinterland. On these occasions they also penetrated into the western territory of Papua, which at that time was under British administration. The complaints of the British authorities were one of the most important reasons which led the Netherlands administration to set up a station in Merauke in the year 1902. Direct European influence on the Marind started at that time, and shortly thereafter became intensified by the establishment of the Roman Catholic Mission.

Very soon after the arrival of the Europeans a venereal disease, the *granuloma venereum*, was introduced into the Marind region. As a result of existing tribal customs it spread quickly and practically everywhere, so that the destruction caused was catastrophic. The depopulation was very fast. However, there is now reason to believe that the great numerical decline of the Marind population did not start at that time, but that such decline was already well advanced before the arrival of the Europeans.

Marind house in the old style.

Marind inland village, new style.

When the influenza epidemic came in the year 1918 it looked as if the fate of the Marind people had been sealed.

A change for the better came in the twenties, owing to an energetic and systematic fight against the *granuloma* and to other new administrative measures. As a result of these the Marind, who previously lived very much scattered, were concentrated into villages, and in these villages it was compulsory for families to live together, contrary to the previous custom according to which the two sexes were publicly separated. Moreover, the old festivities—the focus of ritual sexuality—were prohibited. Since then the number of the Marind population has remained much the same, only a flu-epidemic in the years 1938/39 causing an abrupt numerical decrease.

The Team

The medical members of the team were doctors of the Medical Service of New Guinea: M. Dorren and L. Veeger, both stationed in the south of the island.

Originally it was intended that they should do field work under the supervision of Dr. H. J. T. Bijlmer, who was the medical research leader. However, the work of Director of the New Guinea Medical Service kept Dr. Bijlmer very busy, and consequently in the early stages of the project he had to confine his activities to a general consultative role, and eventually to give up the work altogether.

Sociological studies were made by Father J. Verschueren, missionary of the Order of the Sacred Heart, who has been working in New Guinea these last 25 years and who has an excellent knowledge of the Marind-Anim culture and language, and by Dr. S. Kooijman, social-anthropologist, who is in charge of the South Sea Section of the Ethnological Museum at Leiden, Holland.

Plans for Comprehensive Study

First of all the team had to decide whether to work with one or more random samples, or whether to make a comprehensive study of all the Marind people. The latter was decided upon, mainly because studies of a small number of people could not have been really conclusive. Moreover, possible differences between the sub-territories or villages had to be considered.

However, for practical reasons it was decided not to include in the studies a group of approximately 2,000 Marind living in the western hinterland, but on the other hand to extend the study to people of the Jeei tribe, who live in some six villages along the middle and upper course of the Maro river. Actually the Jeei, just as the Marind, have shown a great decrease of population. The natural surroundings where they live offer practically the same possibilities as the Marind inland. It therefore seemed probable that the inclusion in the investigation of some thousand Jeei people would show results which could be enlightening in relation to various problems likely to arise in making a study of the Marind. This was also a chance to apply the methods of this investigation to people other than the Marind, which would increase its value when considering these methods in relation to other parts of the South Pacific region.

The basis planned for the medical work was: examination of the haemoglobin content of the blood of each person; malaria examination based on the "thick drop" method and a check-up on the size of the spleen; further TBC examination by the Pirquet-reaction method. Great attention was then paid to the problems of child and infant mortality, intra-uterine foetal mortality and to childlessness.

The actual studies of families and registration were to be made by Dr. Kooijman. Special forms were prepared for the purpose, on which data relating to individuals could be entered under family groupings. Both Father Verschueren and Dr. Kooijman were convinced that there is a connection between the tendencies and tensions of society on the one hand, and the behaviour of the individual towards procreation on the other hand. They therefore found it necessary to make the cultural studies as comprehensive as possible, thereby giving special attention to the problem of acculturation. It was decided that Father Verschueren should make these studies, and that he should choose his informants from amongst both older and younger people, as well as from the alien people living along the coast. For all these three categories comprehensive questionnaires were prepared.

Team Operation

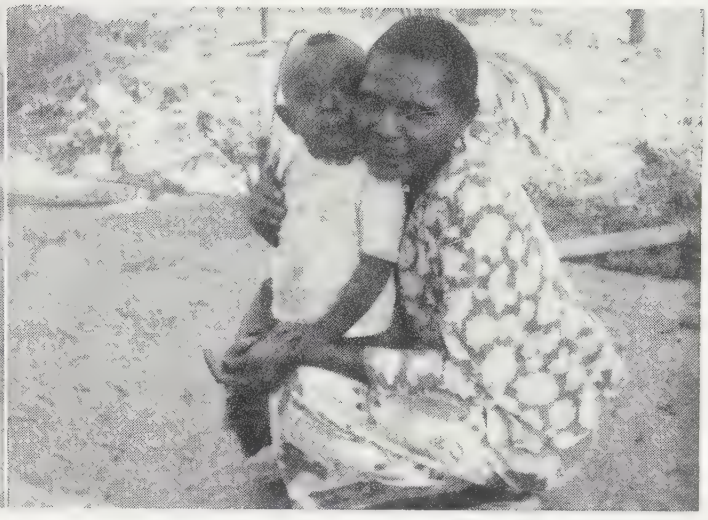
In the period between February and the middle of December, 1953, these plans were put into effect. From Merauke, the base of the team, six different expeditions were conducted and studies made of the various settlements—including the villages—of the Marind territory and of the Jeei territory.

These studies, covering about 7,000 people, took so much time because the population is scattered, living in a great number of small villages (the average Marind village has 150 to 200 inhabitants), and also because travelling between these villages and groups of villages is difficult and very slow, owing to lack of "normal" transport.

Since the greatest possible number of people had to be questioned in each settlement, it was necessary to enlist the help of the village headman—a position conferred by the administration—and of the village teacher to summon people and to keep them in the villages while the questioning lasted. That this method might in some cases make for difficulties and in unconstrained contact between members of the team and those questioned, was a disadvantage that had to be accepted.

It was of great help in the registration

The older generation—Bernadus Bus.



The younger generation, Buti village.

of the population and examination of families that members of the team were able to make use of the registers of births and deaths of the Roman Catholic Mission. The former especially proved to be most valuable, as full data was available on the date and year of birth of all younger people up to an age of about 30-35 years for coastal inhabitants and about 25 years for people inland. This ensured that the demographic data could be based on exact figures, which were much appreciated.

Considerable difficulty was experienced in working up the statistical material. Advice was obtained from the Central Office of Statistics in the Netherlands, and the figures collected were grouped accordingly, and arrangements were then made with the Australian National University for Dr. McArthur of their Demographic staff to work on the material in Canberra with Dr. Kooijman. This assistance was invaluable.

After Dr. Kooijman returned from Canberra with the preliminary results, members of the team in Merauke were in a position to survey the material collected and to arrive at general conclusions. There was only time to do this in outline in the field. The team then dispersed, Father Verschueren remaining in South New Guinea and the other members returning to Holland, where they were able to refer back to professional literature and consult other scientific workers and institutions in the course of writing their detailed report. This report should be ready, in Dutch, early in 1955.

The Results

In the team's view the results of the investigation are generally satisfactory. The first part of the task can be regarded as fulfilled in that the team is now able to point to certain positive causes of the depopulation among the Marind (and also the Jeei) people, centering largely around the hypertrophic sexual character of their culture.

As regards the second part of the task, the team believes that the working methods used—especially the close co-operation between the sociologists entrusted with studies of the cultural and family-life (Verschueren and Kooijman) on the one hand, and the two medical workers on the other hand—will undoubtedly be of value for any other population study to be made in the South Pacific.

Both the findings of this pilot investigation and its working procedures are dealt with in detail in the final report.

Filariasis in the South Pacific

TWO Technical Papers (Nos. 65 and 66) recently published by the South Pacific Commission deal with certain aspects of filariasis in the region.

Paper No. 65 is an annotated bibliography on the epidemiology of filariasis in the South Pacific. This is the first part of a series of bibliography issues on different aspects of filariasis which the Commission has planned to prepare and publish. The present issue contains 115 references; for most of these, detailed summaries are provided of observations relevant to the epidemiology of the disease in South Pacific region. This Technical Paper would be of immense help to worker as a source of ready reference on the subject.

Paper No. 66, entitled *The Distribution of Filariasis in the South Pacific Region* is another important contribution. The paper is divided into four sections, dealing respectively with the distribution and incidence of filarial infections, the distribution and incidence of elephantiasis, distribution of the periodic and the non-periodic forms of *Wuchereria bancrofti* infection, and the vectors of filarial infection in the different parts of the South Pacific. For each of these four sections, the author furnishes a critical review and summary, a detailed statement of the observations made by various workers together with the sources of such information, and a map.

The work is based on a study of over 120 references and would be of immense help to workers on filariasis.

Fisheries Officer's Investigations

The assistance given by the Commission to territories in connection with fisheries has entered a new phase with the appointment last July of Mr. H. van Pel, Fisheries Officer.

After his first investigation in Netherlands New Guinea Mr. van Pel visited Western Samoa, American Samoa and Fiji in August and September last. The scope of his investigations was not less varied than the territories visited and attention was given to fishponds' establishment in Western Samoa, deep sea fisheries as an indigenous industry in American Samoa, and the prospects for improving fish supplies from both the sea and inland resources in Fiji for local consumption.

In November and December, Mr. van Pel spent some weeks in the Kingdom of Tonga, one of the few territories in the South Pacific to have an established fisheries service (under Mr. W. A. Mackenzie, Fisheries Officer) and a fisheries development programme. This territory is also currently interested in the development of pond culture and tuna fishing.

Increased interest in the commercial possibilities of the castor plant is being taken in Australia. This photograph shows castor under trial at Grafton Experiment Farm, on the north coast of New South Wales.

The Castor Plant

..... Its new significance in tropical and sub-tropical countries.

By E. J. E. LEFORT*

Castor oil with its numerous modern uses is fast becoming one of the more important industrial vegetable oils. This article examines the economic aspects, the technical origin and the agricultural implications of the spectacular increase in production which has taken place over recent years.

IN 1953 world production of castor oil, estimated at 550,000 tons, exceeded the 1952 crop by 40,000 tons and equalled the record output of 1948. Since over the same period there has been a tapering off of the wartime industrial demand, it is apparent that new factors affecting the economy of this product have since come into being.

Brazil, India, the United States and South Africa are mainly responsible for the increase shown in the last harvest. South Africa, previously regarded as a minor producer, has increased its production fivefold within three years. It now ranks next to North America, whose 1953 harvest figures are nearly three times as high as those of 1951. The Soviet Union and Manchuria, about which very little direct information can be obtained, may nevertheless, according to statistical estimates, occupy second and third places among the castor oil producing countries.

Throughout the world there is a general tendency to expand production, but it is most marked in those areas where cultivation of the castor plant has been undertaken along modern lines permitting of mechanisation. This indicates that some modification of other agricultural methods might be profitably considered.

Uses of Castor Oil

The industrial uses of castor oil cover a wide range. However, reference will be made only to the most important. Thanks to synthetic chemistry, the following are obtained from one or several of the by-products of castor oil:

—an excellent lubricant for jet-plane turbines which require oil not liable to decompose at high temperatures and having a very low solidification point;

—raw materials essential for the manufacture of electric cable sheaths, synthetic rubber and protective casing;

—a high quality plastic, "rilsan", which serves the same purposes as nylon fibre whilst being superior in many respects;

—synthetic essence of jasmine.

Processing of castor oil by dehydration produces a drying product used in the making of varnishes, water-proof paints, waxes, linoleum, asphalt tiles, etc.

Unprocessed castor oil is used:

—as a fluid for hydraulic systems in aircraft, tanks, guns, trucks, etc., on account of its neutrality and its solubility in alcohol;

—in the making of mild soaps, beauty creams, lipsticks, shampoos and, chiefly, cosmetics;

—in the making of some printing inks, and of typewriter ribbon, carbon paper, etc.;

—in wool-oiling and leather softening;

—as a wetting agent in dyeing and paper manufacture;

—as a cutting oil in iron-smelting.

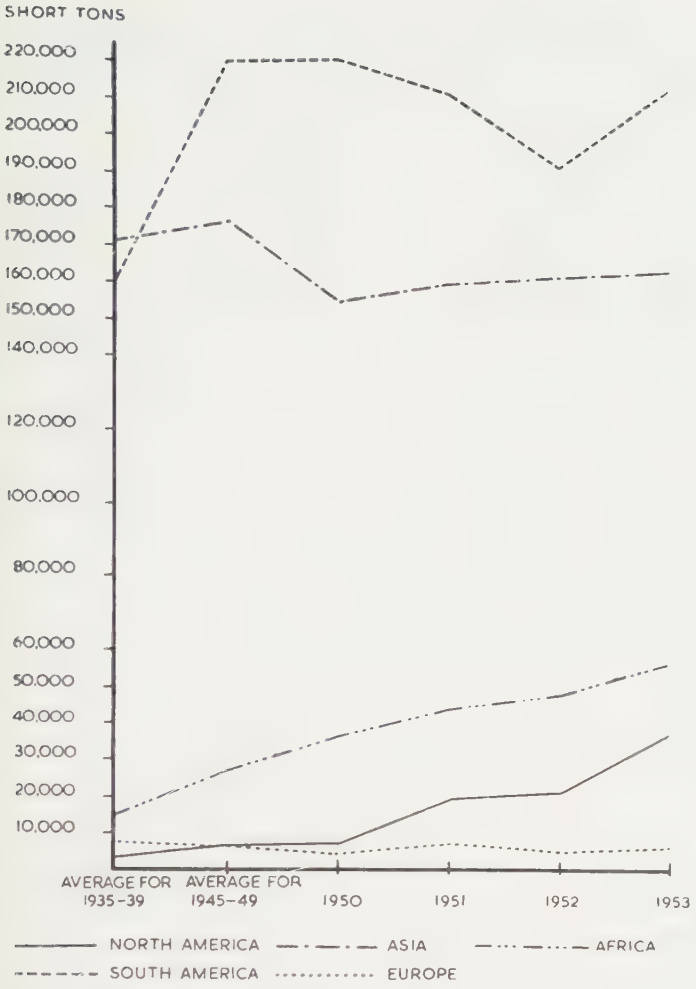
The natural qualities of castor oil and the mobility of its molecular constituents, which can be displaced and combined differently under various forms each corresponding to a new and different chemical, make these numerous uses possible.

Besides the uses mentioned above, castor meal is also used commonly in agriculture; it ranks among the chief organic fertilizers on account of its high nitrogen content.

Economic Prospects

Since it is no longer only in demand for defence industries, the castor oil market has lost the speculative character which previously caused much fluctua-

* Research Officer for Economic Development, South Pacific Commission.



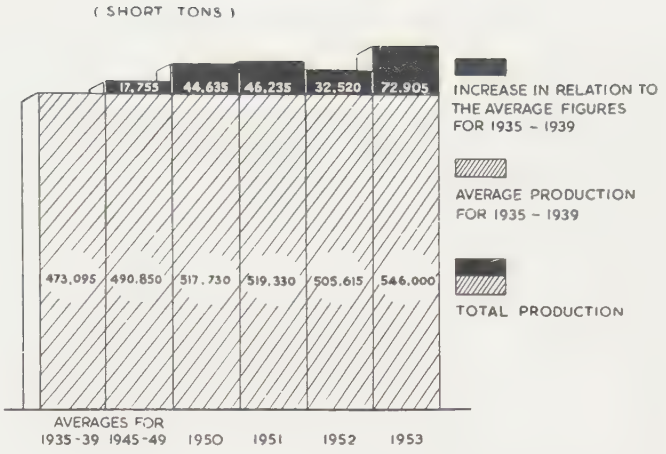
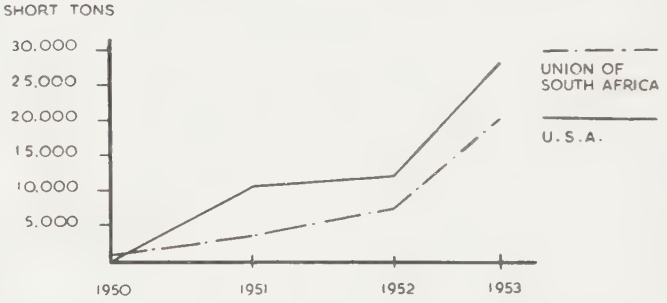


Figure 1 (left): Graph showing the development of world castor oil production by continent.

Figure 2 (above): Graph showing the increase in world production of castor oil.

Figure 3 (below): This graph illustrates two examples of recent appreciable increase in castor oil production.



tion. This has resulted nearly everywhere in the establishment of a yearly guaranteed minimum price which offers the castor plant industry a basis of security hitherto non-existent.

Although the market outlook, therefore, appears most favourable, it must be kept in mind that castor oil will enter into competition with mineral oils as regards most of its uses. It will be accepted on the market only if the price of its by-products is lower than, or at most equal to, that of the products derived from coal or oil. Consequently, incentives should only be given to castor oil production in those cases where it will prove economical in relation to the minimum price guaranteed.

In the South Pacific, this question may be viewed from two different viewpoints, viz.: cultivation, and gathering from natural stands.

This latter form of production could interest atolls on which the castor plant has long since been growing wild. It would be an important step in the further development of coral atolls, a problem which still awaits solution. While such gathering is a primitive agricultural process, it nevertheless accounts for an important part of the production in India and in Brazil and would, moreover, be perfectly adequate in view of the elementary character of agriculture on atolls.

Cultivation might be a valuable proposition in such islands as New Guinea, New Hebrides and Fiji. Their ecological conditions on the one hand, and the fact that they lie within easy reach of the important United States market on the other, should make it possible for them to produce castor seeds at a profit. Similarly, the fact that Australia and New Zealand import 800,000 gallons of castor oil yearly might be considered as an incentive to production.

In the long run, castor plant growing might even give rise to oil extracting industries in the South Pacific. The realization of such a possibility would certainly have a favourable effect for the region, in the economic, social and even strategic fields.

From a study of international market prices, it appears that the United States would eventually prove the only interesting market for the South Pacific area, apart from the possible outlets to be found in Australia and New Zealand.

It should be remembered that we are dealing here with cultivation under wet tropical conditions, likely to produce from one half to one ton of seeds and even more per acre. With an F.O.B. price around 3d.stg. per pound, which might well be the price ruling in the South Pacific area, it is the writer's opinion that a castor plant plantation could be an economic proposition with a minimum yield of 8 cwt. per acre.

On the atolls, whatever the output derived from harvesting the existing or roughly replanted stands, the proceeds would be all gain for the native people. Produce could be transported in pod or seed form at the same time as copra, and graded at the shipping ports.

It will be evident, however, that the part of this article relating to the South Pacific area is based on assumptions only. To prove their validity, it would be necessary for interested territories to undertake a series of agricultural trials in areas apparently suitable for the castor plant.

Harvesting Natural Stands

With a few exceptions, the main variety concerned is a perennial of the *Ricinus communis* var. *zanzibariensis* group whose semi-late maturing forms are particularly interesting. Indeed, the early varieties bear only a few crops and the late maturing ones have an excessive vegetative growth which reduces yield.

In the South Pacific area, the castor plant varieties most often met with belong to the *Ricinus zanzibariensis* and *Ricinus sanguiniensis* groups. They are considered as ornamental plants in villages and weeds on plantations. They sometimes grow in rather thick stands which could be exploited commercially.

This would entail the following measures:

(i) thinning out, leaving a plant every two or three yards;
(ii) cutting back the original plants before the rainy season in order to obtain dwarf bushes, thus facilitating picking;
(iii) sowing the empty spaces with the seeds of semi-late varieties with pods which are not prickly and do not release their seeds at maturity.

Rough sowings could be carried out round about villages.

This primitive method of production could be adapted not only to atolls, but also to other islands in the area. As a family concern and with a yield of 2½ to 5 cwt. per acre, it might prove profitable on the level of indigenous production.

In support of this hypothesis, it is pointed out that the castor plant is exploited partially as a self-grown crop nearly all over the world, and often as an inter-planted crop. In the coconut groves of the South Pacific area this is commonly regarded as a weed, which suggests that its cultivation on this simple scale might perhaps be associated with the coconut.

Large-Scale Cultivation

This is practised essentially on a European scale and would therefore prove interesting to only a few territories in the area.

The variety which is best cultivated on this scale, whether on dry land or under irrigated conditions, is an annual of the *Ricinus communis* var. *minor* type.

Dry Cultivation: The annual castor plant grown under dry conditions requires about 23 inches of rain during the three months following sowing. Temperatures should not be excessive during this period in which germination and vegetative growth take place. Subsequently a progressively drier period is required for normal development.

Ricinus communis var. *minor* is ready for harvesting after five or six months. It occupies the ground for a short period only and can, therefore, be grown as a catch-crop in the South Pacific area, where there is often a well-defined dry season. It could thus be grown after maize, since the castor plant thrives on maize-land and can at present be harvested with slightly modified corn-pickers.

The seeds are sown in groups of a few grains in properly worked and fairly rich soil. After thinning, the distance between plants should be from 24 to 30 inches with the rows about one yard apart. This spacing is adequate for annual, semi-early varieties, which should thrive in the sub-tropical and tropical zones of the South Pacific.

Special dwarf, non-shattering (seed-holding) variety of castor under trial at the Yanco Experiment Farm, New South Wales. The crop has been chemically defoliated to facilitate harvesting.

Care during growth consists of unceasing control of weeds and pests, which vary according to the area. They are generally insects, such as *Xylomyges eridania, Noctua melicerta* and *Phycita diaphana,* the larvae of which eat the tender parts of the plant, and fungi such as *Botrytis cinerea* and *Melampsorella ricini,* respectively causing a grey rot of the stem and a leaf-rust.

The castor plant reacts favourably to vegetable composts and mineral fertilizers, particularly nitrogenous and potash fertilizers, which often give worth-while results.

Under dry cultivation, an economic castor plant crop should yield 8 to 12 cwt. of seeds per acre and can often reach and exceed 16 cwt.

Irrigated Cultivation: This is only practised where a dry climate makes perennial cropping uncertain and dry cultivation impossible. It is mentioned merely in passing, since such conditions are very rarely found in the South Pacific area.

It is the very best method of commercial cultivation. It consists of sowing in previously irrigated ridges which are watered regularly during the vegetative growth of the plant.

By applying the same control measures as for the first method and a more free use of fertilizers, yields of the order of 14 to 16 cwt. per acre, with peak figures as high as 24 and even 32 cwt., are commonly obtained.

Advanced techniques are required for this method of intensive cultivation, especially as regards irrigation.

Varieties and Harvesting Methods: Since the last war numerous agricultural research centres have worked on improving the castor plant. The greatest efforts in this field have been made by America and Russia. There now exist varieties well adapted to each type of cultivation with high yield, a small percentage of hulls (20-22 per cent. of the fruit) and a high oil content (up to 72 per cent. of the kernel).

The dwarf nature of modern castor plant varieties (30 to 48 inches), the fact that the pods do not release the seed and that ripening occurs uniformly, make mechanised harvesting possible. This can be carried out by means of combined harvesting and threshing machines, converted corn pickers or picker-huskers of the "Stripper" type.

Total mechanisation of castor plant cultivation is an adequate solution to the labour problems which affect the economy of certain under-populated territories in the South Pacific.

Conclusion

Castor oil is a coming product. Its increasingly favourable position is related to the stability of its markets which is the direct result of its multiplicity of present-day uses. To this obvious economic reason is added an agricultural advantage: the adaptability of the plant which will thrive, whether cultivated by the most primitive methods or the most highly developed techniques. In view of these two aspects the production of castor oil seems to be possible in the South Pacific area.

However, this can only be ascertained for certain when the castor plant has been submitted to agricultural trials with a view to showing, in line with the chief aim of every agricultural crop, that profitable production could result.

Even if the experimental results might not necessarily be conclusive as regards establishing the castor plant as a main crop, they might nevertheless indicate its value as a catch crop. On this basis, the castor plant would still be of great interest in the area, since it would reduce appreciably the economic dangers associated with the one crop economy of many South Pacific territories.

BIBLIOGRAPHY

Conditions et facteurs nouveaux de la culture du ricin, par Pierre Chonard. Oléagineux, revue générale des corps gras et dérivés. Avril 1954.

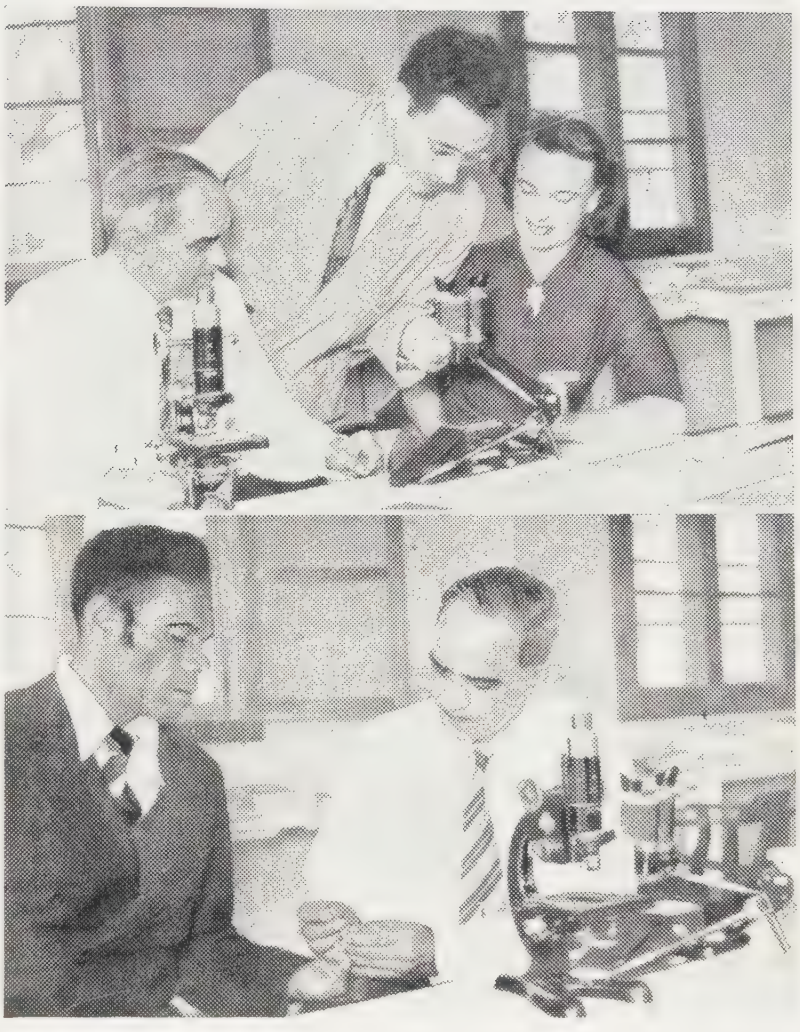
Les plantes à matières grasses—vol. IV, par Jean Adam. Encyclopédie d'agriculture tropicale. 1953.

Le ricin, une nouvelle culture intensive pour les régions tropicales et subtropicales, par le Dr. Otto Knapp. Revue internationale des produits coloniaux et du materiel colonial. Avril 1954.

Filariasis Investigations In New Caledonia

By M. O. T. IYENGAR*

A few cases of elephantiasis are known to occur in some of the coastal areas of New Caledonia. This condition is one of the manifestations of filariasis, a disease transmitted by mosquitoes. The incidence of the disease at the present time is not as large as it was some fifty years ago. Two investigations on filariasis carried out during 1954 have furnished information of considerable scientific interest. Some of the salient findings are indicated below.



TOP: At the laboratory of the French Institute of Oceania in Noumea, Dr. Iyengar, Dr. G. Loison (Research Officer for Health) and Mme. S. Monlau (Technical Assistant) examining material collected during the field surveys on filariasis in New Caledonia. BELOW: Dr. Iyengar examines the blood of M. Braveao for the microfilaria level, prior to his departure for Sydney.

THREE coastal villages in the vicinity of Ponérihouen and Poindimié and an interior village near Bouloupari were investigated. Near Ponérihouen, one village showed a filarial infection rate as high as 37.2 per cent, while another showed an infection rate of 1.5 per cent. Near Poindimié the coastal village studied was found to be free from filarial infection. In the interior village near Bouloupari no cases of filarial infection were observed among the indigenous population.

The filarial infection found in New Caledonia is the non-periodic type of *Wuchereria bancrofti*. The type is different from that which occurs in other parts of the world; the latter is the nocturnal periodic type, the microfilariae appearing in peripheral blood during night and disappearing into the internal organs during the day. In the non-periodic type, on the other hand, the microfilariae are present in the peripheral blood in more or less equal numbers during the day as during night. The distribution of this type of infection is restricted to the eastern section of the South Pacific region.

Until recently we had no knowledge of the mosquito vector transmitting filarial infection from man to man in New Caledonia. The species of mosquitoes that carry the non-periodic type in other parts of the Pacific do not occur in New Caledonia. The present investigations have shown that *Aedes vigilax* is the vector of the infection on this island. As it is a saltmarsh breeder, its incidence is largely restricted to coastal areas, which would explain the coastal distribution of filarial infection on New Caledonia.

Not all coastal areas, however, have filarial infection, and even where the infection is present, its incidence varies depending on the local facilities available for the breeding of the vector mosquito. It was found that filarial infection is localised in areas in the immediate vicinity of mangrove swamps that are favourable for a large output of this mosquito. Where such conditions do not exist, the infection may be absent.

Aedes vigilax, the vector of filarial infection in New Caledonia, is ordinarily a daytime biter; it is most active in the early morning and at dusk. It can fly long distances and may sometimes be found in places two to three miles away from its breeding sites, mangrove swamps. Stagnant pools of saline or brackish water well exposed to sunshine are its favourite breeding places. If the pools are subject to tidal flushing, or if they are well-shaded by vegetation, this mosquito does not breed in them. The main breeding seasons of *Aedes vigilax* is during the dry and hot season, when it constitutes a real pest in many of the coastal areas.

The investigations have been helpful in furthering the South Pacific Commission's research programme. Dr. Woodhill and Dr. Backhouse of the University of Sydney have been conducting researches on the susceptibility of different species of mosquitoes to infection with the filarial parasite. In their insectarium, these scientists have raised large colonies of

(*Continued on Page 34*)

* Research Specialist on Mosquito-borne Diseases, South Pacific Commission.

Market Conditions for Pacific Crops

The following article is based on readings from The Times (London), The Economist, the U.S. Department of Agriculture's Foreign Crops and Markets, The F.A.O. Bulletin and other published sources of economic information received at Commission headquarters in Noumea.

By A. J. L. CATT*

A native tapper on a rubber estate in Papua. In the last nine months rubber prices have risen by about 50 per cent., and efficient plantations with high yielding trees can now make reasonable profits.

IN the *Quarterly Bulletin* for April last a review was made of market conditions for the main cash crops of the South Pacific. Being now at the beginning of a new year it would seem appropriate to examine the changes which have occurred since then and to indulge in a little crystal-gazing into 1955.

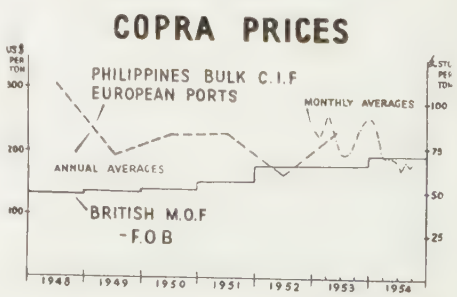
Looking firstly at the general economic situation, it is satisfying to note an easing of uncertainty in the United States. Whereas the question a year ago was how serious the *recession* would become, today it is how complete will *recovery* be. On one hand it is being claimed that the U.S. economy is all set for another "boom", while on the other it is predicted that recent improvements will prove to be merely temporary. The most realistic view forecasts continuation of the present stability, with a moderate upward tendency. It is possible that production in 1955 may exceed that of the previous record year, 1953, but this would by no means indicate a "boom" in an economy, the production of which at the average rate of increase for 1948-53, would this year be 10 per cent greater than in 1953. Nevertheless, it would indicate a high level of demand for raw materials, and certainly one would expect the general tone of U.S. commodity markets in 1955 to be appreciably better than in 1954.

With no sign of any break in European markets, it seems reasonable to expect the general level of demand to increase in 1955. Whether this will be translated into higher prices for the cash commodities of the South Pacific territories will depend on special factors, in particular the level of supply, relating to the individual products.

Copra

In 1954 there was a marked increase in the supply of copra, with the result that by July prices had fallen by 30 per cent from the peak reached in January, 1954. Since then prices have risen gradually but, up to the beginning of the last quarter of 1954, not sufficiently to indicate a definite upward trend. However, in view of the tendency for good and bad copra production years to alternate, there are some grounds for believing that in 1955 supplies will be smaller, and prices on the free markets higher, than those for 1954. In view of the continued substitution of detergents for soap, and the likelihood of high stocks of coconut oil having been built up this year, one would be unduly optimistic, however, to expect this increase to be very pronounced.

So far as British territories are concerned, it is most unlikely that any increase in the contract prices will be negotiated. In the nine months up to September, 1954, the average price for Philippines bulk shipments C.I.F. was about equal to the contract price, which is quoted F.O.B. That is, British territories received a premium over the Philippines free price equal to the shipping and insurance charges. In view of the likely change in supply conditions in 1955, this 1954 premium is not necessarily a justification for a reduced price in 1955, especially since over the whole period of the contracts the Ministry of



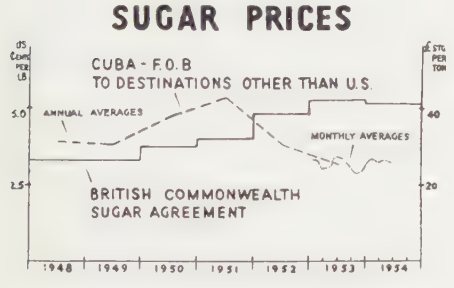
* Technical Assistant to the Deputy Chairman of the Research Council, South Pacific Commission.

Food has on balance paid rather less than the free market price.

Perhaps the course of prices in the free markets in the last quarter of 1954 will be the most important factor determining the price agreed upon. If difficulty is experienced in reaching agreement, it seems likely that the abolition of the agreements and the return to private marketing at some date before 1957, when the present agreements are due to expire, may be suggested as a solution to the deadlock.

Sugar

In our April review mention was made of the International Sugar Agreement under which it was hoped to vary supply, and to a smaller extent demand, with a view to stabilizing the price of sugar within the range of £26-£34 a ton*. At that time producers had been required to reduce output by 15 per cent, but this was not sufficient to keep the price above the lower limit and a further cut of 5 per cent was instituted. In total this 20 per cent reduction was the maximum that could be enforced under the Agreement, and since it too was not sufficient to restore strength to the market, a voluntary cut of 5 per cent. was recommended, and was largely accepted by the main exporting countries. As a result of these cuts together with increased demands by some of the consuming countries, the price did rise for a time to within the desired range. More recently, however, it has fallen again and at the end of 1954 it was about £25 a ton.



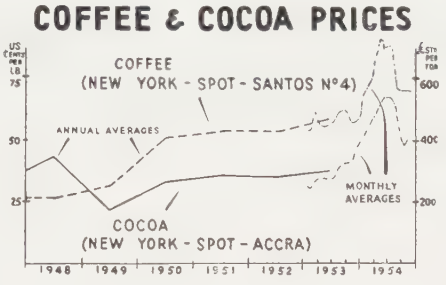
In these circumstances British territories are in a very favourable position under the Commonwealth Sugar Agreement, which provides for a considerable portion of their output to be sold at a fixed price to be determined annually and to be "reasonably remunerative to efficient producers". In 1953, the negotiated price was £42/6/8 a ton; in 1954 it was £41 and in 1955 it will be £40/15/-.

*The pound sterling is the unit of British currency used in prices quoted in this review. Editor.

In the case of Fiji, 125,000 tons per annum can be sold under this agreement. In 1953, this left about 52,000 tons to be sold on the "free" markets, of which nearly 49,000 tons was sold to Canada at the 'free' market price plus £3/15/- a ton, which is the British preference. In the most recent negotiations it was agreed to extend the Commonwealth Sugar Agreement to the end of 1962. Sugar producers in Fiji are therefore well protected, though, as remarked in the April review, the present margin between the "free" market price and the "negotiated" price is cause for concern in the long run.

Cocoa

1954 was an eventful year for cocoa. Opening at a level of about £380 a ton whence it had risen from £270 over the previous six months, the price of cocoa



for early delivery continued to rise, interrupted only intermittently by temporary declines, and reached a peak of £570 towards the end of May. Thereafter there was a setback, and in June the price fluctuated around £500. In July and through mid-August there was an improvement to around £525. But then there followed a decline as spectacular, but not so prolonged, as had been the previous rise, the price falling in the next two months to £350 a ton by mid-October. Subsequently the price rose to about £420 a ton only to fall to about £375 a ton during December.

The explanation of the 120 per cent increase between May, 1953 and May, 1954 is that in that period the results of the failure to plant sufficient cocoa trees in the war and post-war period became suddenly effective. In the years following the war, such measures as price controls, sugar rationing, etc had all tended to disguise the fact that the true demand for cocoa had increased much more than had production. Then in 1953, when world consumption of cocoa increased to 811,000 tons compared with 706,000 tons in 1952, prices remained fairly stable because this increase was met partly by drawing upon stocks and partly by the occurrence of an extremely good producing season. When, however, the 1953-54 season opened, not only were stocks very low but also production was down severely and the nett result was that available supplies were 10 per cent less than demand.

In this situation it was inevitable that prices would rise very substantially, but it is doubtful if the full extent of the rise which did occur was in fact justified. Certainly by the time the peak was reached in May the market was in a very uncertain state. This was largely because manufacturers were unable to gauge consumer resistance because they were still using stocks bought at lower prices and were selling their products at a lower price than was warranted by the full rise in the price of cocoa.

This uncertainty continued during the next few months until in August the mid-crop in Brazil was found to be larger than expected, the Brazilian minimum export price was removed, and the Brazilian exchange rate depreciated. The market being ready to collapse, it did so in no uncertain terms as the larger current production plus stocks bought in expectation of continued high prices were unloaded on to a falling market.

In the coming year, with preliminary estimates forecasting only a moderately larger crop, it seems that the future course of prices will depend mainly on the degree of consumers' resistance which manufacturers encounter. If, as seems likely, it turns out that the prices paid in 1954 were too high, then in 1955 manufacturers will have to buy at prices which enable them not only to overcome the buyers' resistance but also to recoup their losses on the cocoa already bought at the higher prices. Thus on the demand side, until these high-priced stocks are cleared, the market is likely to remain weaker than might be considered normal. This process of clearing stocks is now under way, and the present level of about £375 a ton probably reflects this operation. One would therefore expect some rise at a later stage unless the supply position improves more than expected. Conversely, of course, if the current season is another bad one, an earlier and larger rise would occur.

Over the past 18 months a fundamental disequilibrium in the demand/supply relationship has worked itself out, and henceforth such extreme fluctuations are unlikely. In 1955, and perhaps a year or two afterwards, demand may continue to rise more quickly than supply in which case a slowly upward trend in prices would be likely. Beyond that one cannot hazard a guess in the absence of reliable figures of new areas planted and without knowledge of the future progress likely in the campaign against cocoa diseases. It can be said, however, that with prices at their present level there would need to be a very substantial improvement in supply before cocoa would cease to be a highly remunerative crop.

Coffee

The coffee situation has varied in a similar way to that of cocoa. Since the war, supplies have failed to meet demand and stocks have been gradually eroded. Thus, as well as prices rising, a situation has developed in which the market is greatly disturbed by variations in supply and in expectations of supply. Last year, as a result of a combination of drought, disease and frost, the crop was a very poor one, and a peak price of 95 cents a lb. for spot Santos No. 4 on the New York market was reached in April, 1954.

While this level was not maintained in the face of considerable consumer resistance, the reaction was only to about 88 cents a pound. This high level was set by the minimum selling price imposed by the Brazilian Government on its producers, and when in August, this minimum was reduced and the exchange rate depreciated, the price fell sharply to about 70 cents a pound, around which level it has since fluctuated. Pending estimates of the size of the new season's crops, buyers are reported to be restricting their purchases to a minimum. It is expected that supplies in 1955 will improve, and confirmation of this expectation would probably depress prices somewhat, though hardly to those ruling before the upsurge from mid-1953.

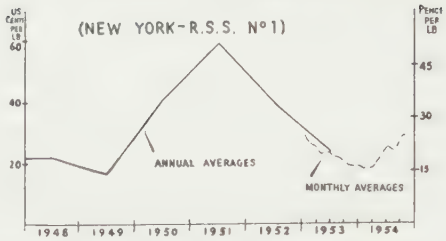
Coffee should still remain one of the most rewarding crops for some time to come. However, in view of reported expanded acreages being planted, the longer term prospects do not appear as secure as for cocoa.

Rubber

In our review of last April, rubber was given as the weakest commodity. Since then prices have risen from 18d. to 28d. a pound for short-delivery No. 1 R.S.S. on the London market.

This increase is cause for satisfaction, but when it is remembered that the control price during the war was 22.5 pence a pound, it can be seen that, at to-day's costs, rubber producers are by no means in a comfortable situation. Furthermore, the percentage of natural rubber used in United States rubber manufactures has recently declined in favour of synthetic rubber, and tyre manufacturers have made it clear that if natural rubber prices remain at the present level, they will increase the proportion of synthetic rubber appreciably. This is perhaps not as bad as it looks, for tyre production is expected to increase significantly this year. Nevertheless, there do appear to be grounds for expecting some fall in natural rubber prices before long, although probably not to the low levels of early 1954. This expectation is, however, very tentative in view of uncertainties such as the extent and procedures of stock-piling programmes, the volume of purchases by Communist countries, and the effect of the sale of U.S. Government synthetic

PRICE OF RUBBER



rubber plants to private enterprise. Regarding this last, there are two opposing factors:

(a) If the plants are sold at a true value the economic cost of producing synthetic rubber (which would include depreciation of plant and taxation) would probably rise above the prices now being charged;

(b) To the extent that they are bought by manufacturers of tyres, for example, a vested interest in running the plants at a high level of production and therefore a greater preference for synthetic rubber is likely to develop.

While all this adds up to a rather bleak and uncertain outlook for existing rubber plantations, it does not mean that investment in natural rubber production is uneconomic. Plantations with high yielding trees are doing reasonably well at present prices, and the solution of the difficulties of the rubber-producing industry appears to lie in the acceleration of replanting and the introduction of more efficient methods.

Fresh Fruits

Little can be added to what was said about this class of cash crops in the April *Quarterly Bulletin*. The main market, New Zealand, can still absorb more fresh tropical fruits than are being supplied. In 1955, incomes there appear likely to be at about the same level as in 1954 so that demand should remain more than adequate.

Summary

To summarize, it would appear that 1955 should be as good as 1954 for South Pacific crops as a whole. Such fluctuations as do occur are unlikely to be large, and declines in some markets and for some commodities can be expected to be offset by rises in others. While as 1955 opens, there is less fear of a depression than a year earlier, there is also no sign of a "boom". This situation of stability is the best environment for sound and balanced progress.

Credit Unions in Fiji

On 1st November, 1954, credit unions in Fiji numbered 51, having increased by 19 since 1st September, 1954. Membership at 1st November stood at 6,092. Since the first credit union was established on 8th January, 1954, 1,843 loans had been made amounting to £F.19,059. Purchase of shares (the credit union equivalent of making deposits) in the same period totalled £F.15,140.

A very tentative idea of the extent to which the credit unions are stimulating saving, especially within the Fijian villages, is given by the following table relating to the 15 Fijian village credit unions which were in existence for the whole of the two months period 1st September, 1954, to 1st November, 1954.

On these figures, it appears that the average amount being saved per member in the form of purchase of shares is about 1s. 4d. a week, or £F.3/10/- a year. In assessing the significance of this, allowance must be made for the fact that many women and children are members, in some villages virtually the whole population being enrolled. The purchase of shares is a continuing obligation on borrowers as well as other members. Thus, even when a loan is used for purely consumption purposes, the member nevertheless is a net saver over the repayment period to the value of the shares purchased. Where the loan is for production purposes, or for the purchase of durable goods, then the repayment of the loan is also in the category of saving, because at the end of the repayment period the member has increased his assets. The purchase of shares in credit unions is therefore only the minimum figure of savings; in addition there is an unknown amount representing the addition to the people's material assets purchased through credit union loans.

Not all of this saving, however, can be taken as the result of the credit unions, for part of it would undoubtedly have taken place in other ways had no credit unions existed. Also, it should be borne in mind that the 15 villages considered are principally on main roads with good communications to markets, etc., and are therefore probably better off financially than the majority of villages.

AGGREGATE FIGURES OF 15 FIJIAN VILLAGE CREDIT UNIONS AS AT 1st NOVEMBER, 1954, COMPARED WITH 1st SEPTEMBER, 1954

	As at 1/9/54	*As at 1/11/54*	*Increase in 2 months*
Number of members	1,703	1,937	234
Number of loans granted	241	466	225
Value of loans granted	£F.3,192	£F.5,366	£F.2,174
Value of shares	£F.3,223	£F.4,314	£F.1,091

Vuna, on the southern tip of Taveuni, is one of the largest and most efficiently operated European-owned plantations in Fiji. It was first established in the "70's". The photo shows the owner's residence, dryers, and some of the labour lines.

The Tropical World

By PIERRE GOUROU

The appearance under the title "The Tropical World" of an English translation of Professor Gourou's book "Les Pays Tropicaux" again focusses attention on this remarkable book which attracted much notice when first published in the French in 1946. This review is based on the English edition for which the author has taken the opportunity to bring up to date his earlier material.

THE main question discussed in *The Tropical World* is how the economic development of tropical lands and their peoples could be obtained.

To find the answer to this question the author emphasizes the poverty and fragility of most tropical soils. As the main causes of the poor quality of tropical soils he mentions soil erosion and the leaching of the bases, resulting in an acidity unfavourable to good use of the humus.

The poverty of tropical soils is shown by their yields, which are inferior to those of soils in the temperate regions. Professor Terra (University of Indonesia) in an article written for the monthly *Landbouw* (Indonesia, 1950) came to a similar conclusion, and saw in this poverty of the soil one of the reasons for the fact that the standard of living in tropical countries is much lower than in temperate regions.

Professor Gourou states that in all hot, wet regions the farmer has found the same solution for the problem of food production, avoiding the loss of soil. Shifting cultivation has been the universal response. This system, however, cannot feed a dense population, and when the population increases it is not able to keep pace. The acceleration of the cycle of fallow ruins the soil, and the damage done by fire will increase as the forest replaces itself less and less.

Professor Gourou states also that the damage done to the fertility of the soil is far greater if pastoral requirements are added to agricultural needs, as they are in the Sudan, East Africa, Madagascar, India and Post-Columbian America. "Hot, wet lands are not eminently favourable to cattle rearing," says Gourou.

I may also quote the following:

"The tropical climate is unfavourable to the preservation of pastoral produce: meat, milk, butter or cheese . . .

"The poverty of tropical grassland results first of all in the slow growth of the animals . . .

"It is estimated that an acre of tropical pasture can feed only 48 lbs. of live weight, whilst the same area in Europe can feed 480 lbs. . . . "

According to Professor Gourou, rearing of cattle in the tropics leads to annual burning of grass and to progressive impoverishment of the soil, which evolution is hastened by the tendency among tropical pastoralists to keep more cattle than the natural savannahs allow.

Professor Gourou concludes his chapter on stock rearing in hot, wet lands by indicating the advantages of the introduction of cattle on a good husbandry basis:

"Traditional pastoralism is not very productive in the tropics without the aid of modern science and does a great deal of damage, for it does not conform to Nature's intentions. But clearly, should cattle diseases allow, stock rearing, when ancillary to agriculture and supplying it with labour and manure, would on the contrary offer great advantages. The keeping of pigs, which utilizes all the waste from the farm, would also be very important."

Discussing the problems of food supply, the author states that the diet of tropical man is essentially vegetarian, even among those tribes who keep livestock. The diet is generally insufficient in calories, and furthermore, it is lacking in balance.

Professor Gourou concludes provisionally that the hot, wet regions are less favourable to man than the temperate belt—

"because they are less healthy and have poorer soils. Their inhabitants exist in more precarious conditions; they have adopted a system of cultivation which cannot feed a large

population, but neither exhausts the soil nor compromises the future; the introduction of pastoralism does not suit the conditions and has on the whole been unfortunate; and the sparse population, insufficiently and irregularly fed, had been unable to bring a high civilization into being."

The study of those hot, wet regions which are densely peopled leads the author to emphasize the fact that in those regions shifting cultivation has disappeared, that there is a production of cash crops, an intensive system of horticulture, crops on irrigated terraces, rice growing in swamps, mixed farming or the plantation of trees. The author says:

"The use of the flooded rice field, of plantations of trees, of irrigation, and of manure got from animals or any other source, and effective measures to check soil erosion are the chief improvements by which it can be hoped to transform the usual system of agriculture in the tropics, that is to say, to get larger and steadier annual yields owing to the preservation of the soil."

The introduction of mixed farming based on cultivation and livestock rearing, seen by several experts on tropical agriculture as the main solution to agricultural development in the tropics, seems to the author not the direction in which hot, wet lands should direct their advance. He warns against striving to seek the economic safety of tropical lands in an agricultural system copied from temperate latitudes. He indicates furthermore that the difficulties that must be overcome by introducing such a system are immense, as agricultural methods are closely linked to types of family organization.

In his conclusion the author states that the cultivation of swamp rice, and to a lesser degree the use of irrigation, is the only means capable of ensuring a steady abundant supply of cereals in tropical lands.

In summarizing, the author says:

"To sum up, it will not be easy to raise the standard of living of tropical people if Nature's directions are obeyed; but it will be utterly impossible if her vetoes are disregarded. In the last resort shifting vegetable plots are incompatible with a high standard of living and will disappear if tropical peoples reach the standard of the most highly developed countries in Europe or America. Furthermore, such methods of cultivation cannot answer the needs of a growing population. Numerous and prosperous populations in the tropics should look for their food supply to the cultivation of swamp rice on low ground, to irrigation, to the possibilities of trade afforded by the sale of commodities obtained from tree plantations run in such a way as to maintain the fertility of the soil, and to a convenient degree of industrial development."

It should be borne in mind that the author, in discussing the whole tropical world, has had to generalise. Even if one accepts his general views as correct, there will be numerous places where specific conditions will ask for a more specific solution, perhaps not at all similar to Professor Gourou's views.

Although my main aim of this review has been only to draw attention to this very interesting and stimulating book, I have, however, two critical remarks to make.

The first concerns the author's opinion on European plantations in the tropics. I quote:

"The European plantations have for long been and still are enterprises involving robber economy, ruining the soil and, when they disappear, as disappear they must, leaving behind them an almost permanent desolation. Whilst native methods of shifting agriculture did no harm to the soil provided the periods of fallow were long enough, European plantations made the land they occupied barren. Quite recently considerable progress in agriculture technique has brought about the important fact of enabling tree plantations to be maintained without risk to the future of the soil and without being obliged to abandon the plantation after the expiration of a certain time. Man has gained the mastery over tropical soil."

I do not agree that it is only quite recently that progress in agricultural techniques has made it possible to maintain tree plantations without risk to the future of the soil and without being obliged to abandon the plantation after the expiration of a certain time.

Although it may be true that in some parts of the world European plantations have had the bad influence as described by Gourou, I do not think the author's generalization does justice to the majority of well-managed European plantations, some of which have already quite a respectable age and are still going strong. Not only would I like to refer to the many hundreds of excellent estates in the former Dutch East Indies, producing—before the war—an important part of the tropical agricultural production for the world market and steadily increasing their production per hectare, but also in the South Pacific region there is little—if any—evidence supporting the author's views.

The New Zealand Reparation Estates in Western Samoa, the largest estates in this region, "still contain areas of bearing coconuts originally planted by the Germans as long ago as 1870. The replanting of these older areas has already been undertaken"—to quote Mr. Eden, the General Manager.*

In the second place, I think it essential that in a work discussing the problems of food supply in the hot wet regions, fisheries as an already important and permanent source of food supply should not be overlooked.

— A. H. J. KROON.

THE TROPICAL WORLD, its social and economic conditions and its future status, by Pierre Gourou, Professor at the College de France and at the free University of Brussels, translated by E. D. Laborde — London, Longmans, Green (1953). xii, 156 p. pls., maps. Original edition published by Presses Universitaires de France, Paris.

* **The Management of Coconut Plantations in Western Samoa**—South Pacific Commission Technical Paper No. 48.

Nursing in Micronesia

(*Continued from Page 20*)

weekly plane, but bulky articles must come by ship from Guam at four-five month intervals. All but two of the hospitals urgently need more graduate nurses. Most of the Guam graduates, who were all women, have married, and home responsibilities and maternity leaves take them off the staff for months at a time. Experience has shown that some men nurses are required to stabilize the service.

Micronesian patients are uncomplaining and endure far more suffering without a murmur than the sick of western lands, but they deserve better nursing care than most of them receive at present.

To meet the urgent demands of the hospitals for nurses, and the larger but less obvious need of people on outer islands for better medical attention, a school of nursing was started on Truk in February, 1953. The students in the first class were all about to graduate from Pacific Island Central School, where a limited number of the best students from every district are sent for two years of education after graduating from the intermediate schools. Five girls and four boys from four districts elected to take the course. They are intelligent, eager to learn and have made far more progress in one and a half years than was expected.

At first, the faculty was limited to one full-time instructor with some valuable assistance in teaching by doctors from the local hospital. Late in October, Miss Kiyoko Sulial, a graduate of the Guam School, who had just completed a year of post-graduate study in Honolulu, joined me and has taken over the supervision of clinical practice. Recently, Miss Agnes Saddler has arrived to set up standards of public health nursing and work out techniques suitable to Micronesian homes. Miss Saddler comes to us through a grant-in-aid from the China Medical Board, Inc., an auxiliary of the Rockefeller Foundation.

In January, 1954, the School moved from Truk to Ponape, where facilities for clinical practice and living conditions for

(*Continued on Page 36*)

LEFT: Tongans displaying three fine specimens of milkfish, of which thousands are taken each year from Lake Ano Ava. They grow to 28 inches long and more.

BELOW: Ano Ava lake, on Nomuka Island, in the Tongan Group. Roughly circular in shape, the lake has an area of 443 acres. It is 4-5 feet deep, and has a mud bottom covered with weed on which the milkfish feed.

Inland fisheries officers and research workers will be interested in the discovery that . .

Milkfish Are Breeding In Lake Ano Ava

A discovery that may well prove to be a major advance in the development of pond culture of edible fish was made during a recent visit by the author to Nomuka Island, in the Tongan Group. Here he found that in a small lake on the island, milkfish, hitherto regarded as a species that will not spawn in enclosed waters, have been breeding and maturing for many years. The significance of his discovery is explained below.

By H. VAN PEL*

IN many coastal regions of Asia very considerable quantities of milkfish (*Chanos chanos* Forskal) are raised in fish ponds. Although these are referred to as brackish-water fish ponds, in some the water is almost fresh while in others the salinity is much higher than that of seawater.

The milkfish is a sea fish, and adults are sometimes caught near the coast in fish traps. The fry of this fish is caught by fishermen near beaches and put in ponds. In the course of 8 - 10 months they grow to a size suitable for consumption.

It is a peculiar fact that the fish never spawn in these fish ponds, even when kept in them for lengthy periods. In other words, adult milkfish in fish ponds produce no progeny. Experts of world renown have for many years been investigating this problem, but up to the present, so far as I know, a solution has not been found. Consequently only those places which are near the points where the fry are found are suitable for the raising of milkfish. To catch and transport fry over long distances to ponds is very expensive, and many die en route.

One can thus see that if the milkfish would breed in ponds, a marked advance in pond cultivation of this species would follow, and greatly increased production would result.

Recently I made a trip through the Tongan Archipelago in the South Pacific Ocean and visited, among other islands, Nomuka Island, which is situated about 60 miles N.N.E. of Nuku'alofa, the capital of Tonga.

This small island has a saltwater lake which has no connection with the sea, being some 300 yards distant from it. The lake is roughly circular in shape and covers an area of 443 acres. I found that in this lake, which is called "Ano Ava" (*Ava* means milkfish and *Ano* means lake), milkfish have been breeding and maturing for many years, thousands being caught there every year. I saw some 28 inches long.

About 48 years ago the lake was overfished and was then restocked with milkfish fry brought from another place. Since that time there has always been fish in the lake.

During my visit the salinity of the water was below that of seawater (much rain had fallen during the previous week), but in the dry season it is higher. The lake is 4 - 5 feet deep, the water being turbid as in fishponds. Its temperature during my visit was 28.5°. The lake has a bottom of grey-black, sulphurous-smelling mud, in which grow weeds on which the fish feed.

Probably the only reason the water is salt is because of the porosity of the soil, which permits seawater to seep through to the lake. It seems that the fish spawn in the last quarter of the

* Fisheries Officer, South Pacific Commission.

year. At the end of the year, after the rains, the surface of the lake is crowded with fry. Much of this fry, when it reaches fingerling stage, is used as bait for handline sea-fishing.

I feel that a detailed scientific study of the biological cycle of the milkfish in this lake on Nomuka Island may assist in solving the problem of breeding milkfish in enclosed waters, and for this reason the Commission is informing workers and institutions carrying out research in this field, of this discovery with a view to further investigations being undertaken.

It is quite possible that there are more inland waters in the Pacific area where milkfish (*Ava*) will spawn. If so, any relevant information will be welcomed.

W.H.O. Meeting at Manila

The Fifth Meeting of the World Health Organization Western Pacific Regional Committee was held at Manila, Philippines, from 10th - 16th September, 1954, under the chairmanship of Dr. F. S. Maclean, Head of the Public Hygiene Department, Ministry of Health, New Zealand.

Fourteen countries were represented. Amongst the delegates were two members of the South Pacific Commission Research Council: Dr. J. Bierdrager, Head of the Netherlands New Guinea Health Department, and Dr. R. Augère, Head of the New Caledonian Department of Health. The Commission sent Dr. G. Loison as an observer.

In the Commission's area of activities, the Organization will provide assistance for campaigns against malaria, tuberculosis and yaws; it has, moreover, granted a number of scholarships to personnel working in the region.

Attention was drawn to the importance of insect-borne virus diseases. Reports prepared by local experts will be submitted to the World Health Organization Committee of Experts, who will decide on the desirability of organizing discussions on this problem.

At the chairman's request, Dr. Loison outlined the South Pacific Commission's work programme and the results obtained, with particular reference to subjects investigated with the co-operation of the World Health Organization. Dr. I. C. Fang, Director of the Regional Bureau, thanked the Commission for its participation, and announced that next year the Commission would be asked to evolve a programme of filariasis control in South East Asia. Various delegates requested that collaboration between the two organizations be encouraged.

Dr. Loison discussed common problems with the local medical authorities and conferred with the Regional Bureau's technical advisers, certain of whom are to visit the South Pacific during the year 1955.

Dr. Iyengar examines a brackish water pool near Ponerihouen for larvae of Aedes vigilax.

Filariasis In New Caledonia

(*Continued from Page 27*)

different species of mosquitoes and their hybrids with a view to studying experimental infection in them.

To facilitate their researches, a suitable person with the non-periodic type of infection was selected from the Ponérihouen area and sent over to Sydney through the very generous offer by M. Jean Hagen of a free passage from Nou méa to Sydney and back on his ship, "New Hebredais II". M. Braveao Issaia Noel, the selected man, spent a month at Sydney and gave the fullest measure of co-operation in an investigation of humanitarian and scientific interest.

A preliminary report on these tests by Drs. Backhouse and Woodhill will soon be published. The results show that the filaria occurring in New Caledonia does not develop in any of the *Aedes* mosquitoes present in Australia, and that it develops well in a species of *Aedes* prevalent in Fiji.

To summarise, filarial infection in New Caledonia is the non-periodic type and has a patchy coastal distribution. The vector of the infection is *Aedes vigilax* that breeds in stagnant brackish water pools exposed to sunshine. This mosquito is a strong flier and bites chiefly during daytime.

The incidence of filarial infection in a locality is determined by the numerical prevalence of the vector mosquito. Ordinarily, areas with a high incidence of filarial infection are characterized by the occurrence of a fair number of cases of filarial disease, as for example, elephantiasis. In New Caledonia, on the other hand, in spite of the presence of filarial infection, the incidence of cases of elephantiasis is remarkably low. Consequently, filariasis is not an important public health problem in this country.

The reasons for the low incidence of cases of elephantiasis in spite of the occurrence of filarial infection, are being investigated.

Second Malaria Conference

Dr. Robert H. Black, malariologist, School of Public Health and Tropical Medicine, Sydney, acted as observer for the South Pacific Commission to the Second Malaria Conference for the Western Pacific and South East Asia Regions, held at Baguio, Philippines, from 15th to 24th November, 1954.

The report of the ten-day conference, which brought together 42 malariologists from 13 different countries under the auspices of the World Health Organization with the co-operation of the Government of the Republic of the Philippines, reviews the problems connected with the malaria-carrying mosquitoes of the regions, research in the field of malaria, the role of drugs in the fight against malaria and national control programmes.

The report gives examples of nation-wide malaria programmes now being carried out in the two regions. It emphasizes the heavy cost to the community of malaria due to its effects on physical, economic and social health. Russell's statement that "no country with a serious malaria problem can afford *not* to control malaria" is again endorsed, and the undoubted benefits that have followed malaria eradication projects are also stressed.

To reach the ultimate goal, eradication of the disease, the Conference considered that not only should more funds be devoted for control programmes, but that efforts to train adequate numbers of personnel should be intensified.

QUARTERLY READING LIST No. 13

A bibliography of publications relating to social development in the South Pacific.

THIS Reading List represents an attempt to note every item to appear in the field of Social Development in the South Pacific during the quarter; the entries are drawn from over 100 periodicals which are regularly examined, as well as from bibliographies, publishers' notices and similar material. While it is clearly impossible to check for errors which may occur in the latter type of material (for example, in the classification used in the original sources or in the entries themselves), it is felt that this danger is outweighed by the relatively complete coverage given by this method of compilation. Publications of the South Pacific Commission have not been indexed. Items marked with an asterisk have not been seen in the Social Development section.

The Executive Officer for Social Development, G.P.O., Box 5254, Sydney, will be glad to obtain for any metropolitan or territorial Government copies of items listed, even though the original material may not be available in Sydney.

SOUTH PACIFIC — GENERAL

Development

(1) McAULEY, J.: Paradoxes of Development in the South Pacific. *Pacific Affairs,* vol. 27, no. 2, June, 1954. pp. 138-149.

Education

(2) UNESCO: Compulsory Education in South Asia and the Pacific: report of the Bombay Conference, December, 1952. Paris, Unesco, 1954. pp. 157, bibl. (Studies on Compulsory Education xiii.) The chief Pacific territories concerned are: Fiji, New Caledonia, Papua and New Guinea, Western Samoa and Netherlands New Guinea.

Research Institutes and Programmes

(3) *Tri-Institutional Pacific Program.* Annual report for the year ending June 30, 1954. 16 pp. *Processed.* Programme sponsored by Yale University, University of Hawaii and the Bishop Museum with a financial grant from the Carnegie Corporation. Describes research projects in progress and planned.

POLYNESIA

Anthropology

(4) DAMM, H.: Religious Wooden Images from the North-Western Fringes of Polynesian Islands. *Yearbook of the Ethnological Museum of Leipzig,* vol. 10, 1952.*

(5) SANDWITH, G. *and* H.: Research in Fiji, Tonga and Samoa: Hindu fire-walking, the Sufi Ratib, Polynesian atua and Fijian black-magic. Reigate, Surrey, the Omega Press, 1954. 24 pp., illus. Address given to the Medical Society for the Study of Radiesthesia, June 25th, 1953.

Description

(6) DERRICK, R. A.: The Central Islands of the South-west Pacific. *Etruscan,* vol. 4, no. 1, June, 1954. pp. 19-23, illus., map.

(7) OCEANIA: *Man,* vol. 44, February, 1954. pp. 33-35. Reviews of various recent books, including: Buck's "Explorers of the Pacific", Koskinen's "Missionary Influence as a Political Factor in the Pacific Islands", Lovy and Bouge "Grammaire de la Langue Tahitien", and Stanner's "The South Seas in Transition".

BRITISH SOLOMON ISLANDS

Linguistics

(8) RAWCLIFFE, D. A.: The Language of Ugi. *Journal of the Polynesian Society,* vol. 62, no. 4, December, 1953. pp. 359-365.

FIJI

Anthropology

(9) ROTH, G. K.: Model Spirit Houses from Fiji. *Journal of the Polynesian Society,* vol. 62, no. 4, December, 1953. pp. 406-409, illus.

Community Development

(10) HAYDEN, H.: "Moturiki: A Pilot Project in Community Development": a review. *Times Review of the British Colonies,* No. 15, Autumn, 1954, p. 29.

Co-operation and Co-operatives

(11) FIJI: *Credit Union Central Committee,* Elementary accounting procedure for credit unions in Fiji. Suva, the Committee, 1954. pp. 27. *Processed.*

(12) FIJI. HORACE PLUNKETT FOUNDATION: Year Book of Agricultural Co-operation, 1954. Oxford, Blackwell, 1954. pp. 299-304. Recent developments in the Territory.

FRENCH OCEANIA

Art

(13) LYON, R.: Une Conférence sur Gauguin. *Bulletin de la Société des Etudes Océaniennes,* vol. 9, no. 6, June, 1954. pp. 241-260 (to be completed).

History

(14) Le "Messager de Tahiti" *Bulletin de la Société des Etudes Océaniennes,* vol. 4, no. 6, June, 1954. pp. 261-274. History of the journal which began in 1852 and was the predecessor of the present "Journal Officiel", together with an index of articles appearing in it concerned with local history and scientific studies.

Music

Asmatters. *Tijdschrift "Nieuw-Guinea",* (i), Géographie musicale aux Iles Sous-le-vent. (Epei de Maupiti, Patio de Tahaa.) *Bulletin de la Société des Etudes Océaniennes,* vol. 9, no. 6, June, 1954. pp. 231-240.

GILBERT AND ELLICE ISLANDS

Anthropology

(16) KENNEDY, D. G.: Land Tenure in the Ellice Islands. *Journal of the Polynesian Society,* vol. 62, no. 4, December, 1953. pp. 348-358.

(17) LAXTON, P. B.: A Gilbertese Song. *Journal of the Polynesian Society,* vol. 62, no. 4, December, 1953. pp. 342-347, music.

NETHERLANDS NEW GUINEA

General

(18) FEUILLETAU de BRUYN, W. K.: W. C. Klein's "Nieuw Guinea": a review. *Tijdschrift "Nieuw-Guinea",* (i), vol. 15, no. 1, May, 1954, pp. 26-32; (ii), vol. 15, no. 2, July, 1954, pp. 56-63. Review of vol. 1 of the book.

Anthropology

(19) FEUILLETAU de BRUYN, W. K.: Goederenruil en Handel bij de Primitieve Stammen van Nieuw-Guinea. *Tijdschrift "Nieuw-Guinea",* (i), vol. 14, no. 3, September, 1953, pp. 72-83; (ii), vol. 14, no. 6, March, 1954, pp. 168-175; (iii), vol. 15, no. 1, May, 1954, pp. 7-12; (iv), vol. 15, no. 2, July, 1954, pp. 39-45.

(20) ZEGWAARD, G.: Vrouwenruil bij de Asmaters. *Tijdschrift "Nieuw-Guinea",* (i), vol. 15, no. 2, July, 1954, pp. 33-38 (to be continued).

Bibliography

(21) Bibliografie van Nieuw-Guinea. *Tijdschrift "Nieuw-Guinea",* vol. 15, no. 2, July, 1954. pp. 55 and 64.

Community Development

(22) Het Nimboran Plan. *Tijdschrift "Nieuw-Guinea",* vol. 15, no. 2, July, 1954. pp. 48-51. Description and comment on the community development scheme.

Music

(23) KUNST, J. J.: The Original Music of Western New Guinea. Amsterdam, Royal Institute for the Indies, 1950. 80 pp.*

PAPUA AND NEW GUINEA

Anthropology

(24) BERNDT, R. M.: Reaction to Contact in the Eastern Highlands of New Guinea. *Oceania,* vol. 24, no. 3, March, 1954, pp. 190-228; vol. 24, no. 4, June, 1954, pp. 255-274.

(25) BURRIDGE, K. O. L.: Cargo Cult Activity in Tangu. *Oceania,* vol. 24, no. 4, June, 1954. pp. 241-254, map.

(26) NEVERMANN, H.: The Jabga of Southern New Guinea. *Baessler-Archiv*: contributions to ethnology. In co-operation with the scientists of the Ethnological Museum Berlin-Dahlem. New Series, vol. 1, 1952.*

(27) SCHUY, J.: House Building with the Qunantuna. *Archiv fuer Voelkerkunde* (Vienna), vol. vi-vii.*

(28) VELLACOTT-JONES, K.: The Tari People of New Guinea: A remote tribe whose way of life may resemble that of the inhabitants of a hitherto unknown neighbouring area. *Illustrated London News,* 10th July, 1954. pp. 57-61.

Bibliography

(29) Bibliografie van Nieuw-Guinea. *Tijdschrift "Nieuw-Guinea",* vol. 15, no. 2, July, 1954. pp. 55 and 64.

Co-operation and Co-operatives

(30) MILLAR, C. J.: Papua and New Guinea. HORACE PLUNKETT FOUNDATION. Year Book of Agricultural Co-operation, 1954. Oxford, Blackwell, 1954. pp. 36-47. Recent developments in the territory.

Description

(31) BARRETT, C. L.: Isles of the Sun. Melbourne, Heinemann, 1954. xiv, 258 pp., illus., maps.

Directories

(32) ROBSON, R. W. (*Compiler and Editor*): Handbook of Papua and New Guinea, 1954. Sydney, Pacific Publications, 1954. 319 pp., illus., maps, diags. Includes history, description, etc., of territory and list of all non-native residents as at mid-1953.

Education

(33) Pidgin English. *Current Affairs Bulletin,* vol. 14, no. 12, September 27th, 1954. pp. 179-192. Discusses Pidgin from a linguistic viewpoint and then the problems and advantages of its use in Australian New Guinea.

Government and Administration

(34) SINCLAIR, J. P.: Patrolling in the Restricted Areas of Papua and New Guinea. *Australian Outlook,* vol. 8, no. 3, September, 1954. pp. 129-145. Account by a Patrol Officer of the trials, difficulties and problems facing those patrolling in these areas.

Linguistics

(35) BERNDT, C. H.: Translation Problems in Three New Guinea Highland Languages. *Oceania,* vol. 24, no. 4, June, 1954. pp. 289-317.

(36) LUZBETAK, L. J.: The Middle Wahgi Dialects (New Guinea), vol. 1. Banz Grammar. Banz (New Guinea), Catholic Mission, 1954. ix, 245 pp. *Processed.* A preliminary edition only, the intention being to issue a revised version (including a complete dictionary) a year or so hence. Another volume discussing the differences found in other major dialects of the Middle Wahgi (Nondugl, Kup, Minj and Kudjib) is also in preparation.

Nursing in Micronesia

(*Continued from Page 32*)

students are better. Ponape is bountifully supplied by nature at all seasons with food and water.

The Curriculum

Subjects taught have included Anatomy and Physiology, Microbiology, Nursing Arts, First Aid, Use of Visual Aids, Medical Diseases and Treatment, Surgical Conditions and Treatment, Pediatrics, Obstetrics including some Midwifery, and Pharmocology.

The content of each course has been adapted to the requirements of Micronesia; for example, in Medical Diseases only those disorders which are actually found here or which might invade the area at any time (such as malaria or measles) have been taught; in First Aid, locally available materials were discussed.

A health worker on an outer island, to be effectual, must be able to dignose and treat common diseases, to incise and treat superficial infections, to cleanse and sew up accidental wounds, and do simpler forms of operative as well as normal midwifery. In other words, a Micronesian nurse away from the district hospital must be able to combine some of the functions of the doctor with the duties of a nurse, and must also be able to persuade the people to change harmful customs and habits which transmit disease (for example, the mother's practice of masticating food in her own mouth for her baby). We have attempted to instruct the students in how to do these things and have given them as much supervised practice in doing them as possible.

The limited clinical material in the wards of our small hospitals is probably our greatest handicap. We had hoped to give the students a wider variety of experience by moving them about between several of the district hospitals, but lack of transportation at appropriate times makes this plan impractical. To compensate, the students are spending extra time in out-patient clinics. Within a few months we plan to set up a health centre in a village about three miles from the hospital. There each student will have experience under supervision in dealing with health situations which are likely to be duplicated in any village in the Trust Territory, and also to learn how to teach health to people who do not even have a word for "health."

This brings up another difficulty—languages. The 57,000 people of Micronesia use at least nine distinct languages, and each island has its own dialect. A native of Ulithi Atoll who goes to Yap 90 miles away can no more make himself understood than we could make ourselves understood in Tibet. Students of nursing are drawn from all parts of the Trust Territory. They must be able to talk to their patients. Therefore, they must learn to speak Ponapean, so a course in Ponapean will be added to the curriculum for a new class which will enter in September. One of the prospective members of the class from the Ponape District will need to take the course because she comes from the island of Mokiel, which has a different language.

English is the only common language among the students, and is used entirely in teaching. Even though the students are usually proficient enough to carry on a general conversation, the technical vocabulary of British and American textbooks is beyond them at the beginning of the course. To get around this difficulty, we prepare mimeographed material for them in which sentence structure is simple and technical terms are used in graduated doses. They like to learn medical terms, and by feeding new words to them gradually they have built up in one and a half years an adequate medical vocabulary. Most of the class can now read and understand American nursing textbooks.

A start has been made in preparing health workers for Micronesia, but like a blind man on a strange road, we must feel our way. Many changes will undoubtedly be made in our programme before the results will be satisfactory. But the problem is challenging.

The students are keen and receptive, so we hope that as graduates, they may serve their peoples intelligently and help to adjust the pattern of training to meet the health requirements of people in this area.

PICTURE CREDITS

Acknowledgment is made for photographs reproduced in this issue, as follows: Page 7, French Institute of Oceania, Noumea; page 11, Netherlands Information Service; page 13, *Berita Perikanan*, Djakarta; pages 19 and 28, Australian Official Photos; pages 24 and 26, New South Wales Department of Agriculture; page 31, Fiji Official Photo; page 27, plate by courtesy *France Australe*, Noumea.

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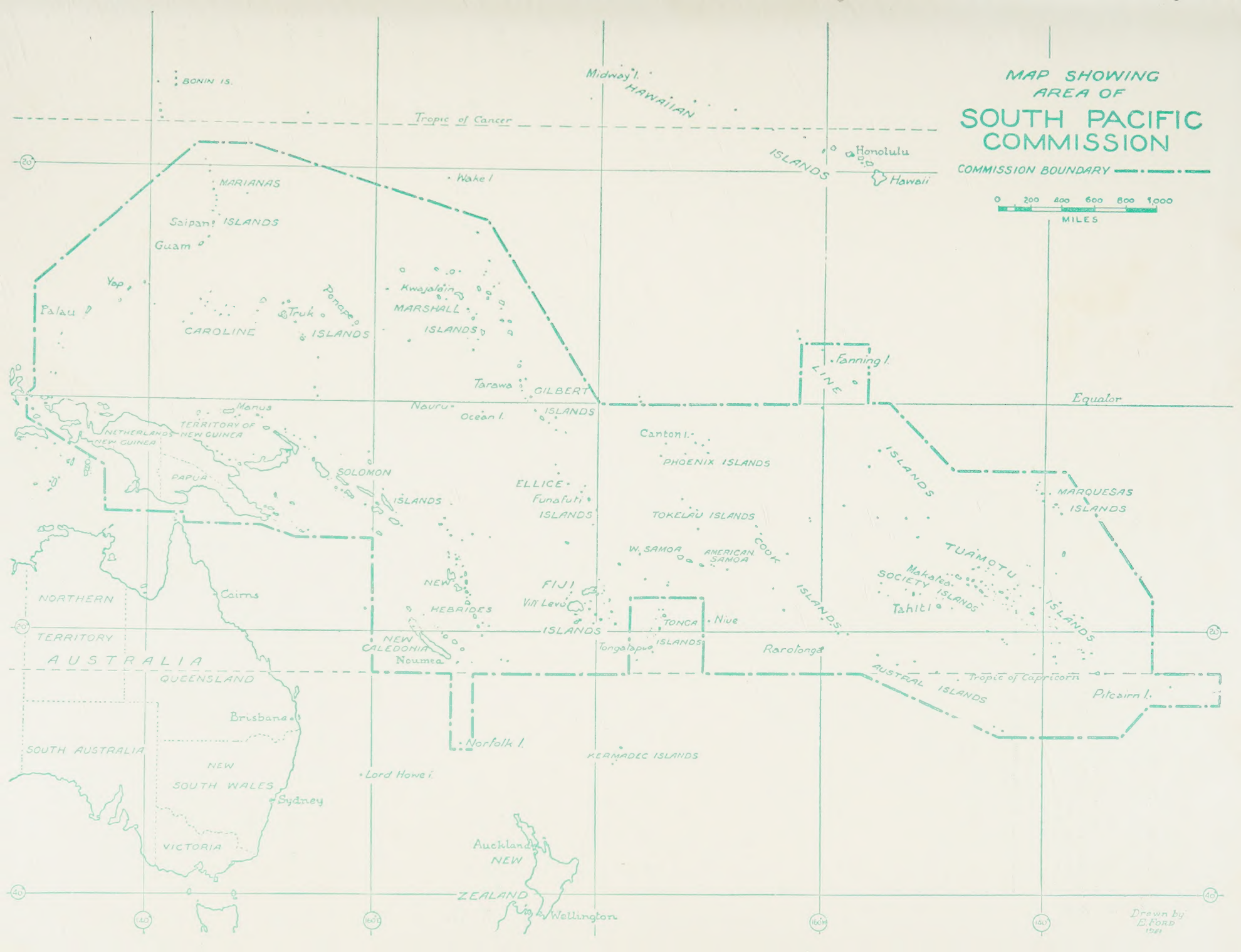
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1. **The Co-operative Movement in the Gilbert and Ellice Islands.** By H. E. Maude. February, 1949. 31 pp.
2. **Community Development.** March, 1950. 27 pp., bibliography.
3. **The Village Library.** April, 1950. 9 pp., book list.
4. **Visual Aids in Education in the South Pacific.** By A. L. Moore, Visual Aids Consultant. April, 1950. 58 pp.
5. **Fisheries and Animal Health Research Projects of Significance for the South Pacific Region,** conducted under the authority of the C.S.I.R.O., Australia. May, 1950. 9 pp.
6. **A Preliminary List of Economic Plants of New Caledonia.** By J. Barrau, Director of Agriculture, New Caledonia. July, 1950. 10 pp.
7. **A Preliminary List of Plants Introduced into Tahiti.** July, 1950, 21 pp.
8. **Insect Pests in the Wallis Islands and Futuna.** From report by F. Cohic, Entomologist, Institut Francais d'Oceanie. Dec., 1950. 30 pp.
9. **Report of Plant and Animal Quarantine Conference, Suva.** April, 1951. 24 pp., two annexures.
10. **Bibliography of Co-operation in the South Pacific.** April, 1951. 10 pp. (Out of print. See Technical Paper No. 51.)
11. **Interim Reports on the Moturiki (Fiji) Community Development Project.** By Howard Hayden, Director of Education, Fiji. May, 1951. 48 pp.
12. **Tuberculosis Investigations by the South Pacific Commission in 1950.** May, 1951. 124 pp.
13. **Vocational Training Facilities in Australia for Students from South Pacific Territories.** May, 1951. 8 pp. (Out of print.)
14. **Educational Broadcasts to Samoan Village Schools.** Department of Education, Western Samoa. May, 1951. 7 pp.
15. **Libraries for Beginners.** By Dr. & Mrs. Kenneth Todd, Kwato Mission, Eastern Papua. July, 1951. 21 pp.
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